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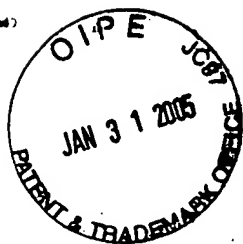
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PATENT
Docket No.: A-69185/MSS (468984-1)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Jeffrey L. Peyton

Serial No. 09/808,650

Filed: **March 14, 2001**

For: **Puppetry Based Communication
System, Method and Internet Utility**

Examiner: **J. P. Ouellette**

Art Unit: **3629**

Date: **December 28, 2004**

DECLARATION UNDER 37 CFR §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The undersigned, Jeffrey L. Peyton, does hereby declare that:

1. I am currently President and Chief Executive Officer of Puppetools, Inc., a corporation formed under the laws of the State of Virginia, a position I have held since 1983.
2. I obtained a Bachelor of Arts from Bard College.
3. I am the sole inventor of the above reference United States Patent Application Serial No. 09/808,650 filed on March 14, 2001, entitled "Puppetry Based Communication System, Method, and Internet Utility."
4. In the early 1970s, under a series of grants, I began conducting puppetry workshops. Based on the many observations by teachers of children responding to puppets, I became increasingly interested in puppets because of the innate response they appeared to spark in both children and teachers. The hand-connectedness of puppets seemed to reveal something about

human nature and communication. After one workshop I presented, I recall slipping a paper mechanism over the fingers of my hand, and glimpsing in that folded sheet of construction paper a new world of communication. I called this paper device ‘the hinge’ or ‘the paper talker,’ and I would begin to perceive this multifaceted tool as a living language of symbols—a living form of media and a living technology. I would come to see the hinge as a vehicle that could facilitate broad application of communicative play—a behavior that, except for early childhood and child-life educators, has been increasingly undervalued and considered irrelevant in the field of education. Interestingly, a growing number of neuroscientists consider play to be a crucial focus in the science of learning.

I would eventually come to view puppets as not merely art, but also as a ‘bio-media’ whose widely recognized ‘magical’ effect on children derives directly from the brain’s capacity to communicate on a playful wavelength—a fact that children know innately but which adults, especially in education, either forget or never learn at all. Conventional pathways of teaching and learning are largely “off” this wavelength. Contrastingly, teachers new to puppets consistently report that their use of the medium helps children feel good and safe, and increases their receptivity to learning. The nutrients carried in puppet play make the act of communicating social, disarming, visual, and symbolic—qualities of thinking often ascribed to great scientists and innovators. What if children and teachers routinely shared communication of this nature?

The question propelled my work, and I was challenged to make puppets a practical communication tool. But educators, I reasoned, would never learn the communicative value of puppets unless puppets somehow became integral to the learning culture. Again and again the paper hinge appeared as a key. Puppets made of paper built on the hinge proved as powerful, if not more so, than elaborate commercial models. No scripts or theaters were necessary. In the hands of a teacher, a paper puppet could be made in minutes by a teacher, using it to speak a ‘handheld language’ right out in front of the group. Even a classroom of older sixth-graders was captivated by spontaneous conversation sparked by the novel ‘third party.’ In addition to the communication skills and training that educators would require as a primer to use ‘puppet language’, the tools of play would have to be physically at hand. Toward that end, I believed that paper puppet media could be standardized—*not as a select group of proprietary puppet characters*—but as an open-ended resource of limitless forms based on a single universal device. The power of this playful media would thus flow outward into education. The generation and distribution of play as both energy and media could be accomplished partly by exploiting the contagious and viral personality of play, and partly by embedding puppets in a wide variety of products. Only the paper hinge could integrate across a broad spectrum of media and products,

making it possible to embed, print, or download customized puppets using printable patterns to make paper models. Given the systematic, simple, and uniform quality of the hinge, I was convinced the device could work, as it already was, in the hands of teachers not only as a personal, open-ended language, but also, potentially, in the broad range of cultural tools and products used in education that, conceivably, would one day include the tools and principles of communicative play. If established commercial companies eventually wanted to use this play utility, a patent would enable me to benefit from a life work of invention and research. For the record, three patents have been awarded: (US Patent 4,880,404) and Paper Talker® Puppet Device (US Patents 4,555,236 and 4,869,702)

Although I was able to obtain the above patents and rights to market the one mechanical device that could meet all the requirements here described, it made little difference. Without the overarching validity of a universal play language, the hinge would remain just another craft oddity. If, however, play became recognized, beyond the early childhood nicety, as a distinct resource and product of the brain, then play language, media, and technology could be validated as valuable components in a comprehensive communication platform engineered to harness, facilitate, and disseminate communicative play. If tools of playful communication could be engineered, as a standard communication utility, into products, then the nature of communicative play could always be “at hand.” By virtue of this system, the behavior of communicating playfully, visually, and emotively could become a robust, second nature outcome. Such a vision not only required the reinvention of conventional puppet art into a standardized, predictable media (which the hinge made possible), but also required proof that puppet play was, in fact, a transmitting agent of the brain’s preference for communication that used movement, color, symbol, the emotions, and use of the hand.

In order to become familiar with brain-related behaviors, I began to research play behavior. My path followed in the tradition of field biologists who have researched the communicative behavior of apes, ants, and bees, except in my case the focus on communication was sparked by art-based life forms that are unique to human communication, ***namely puppets—and by the response of children to them.***

I pushed the conventional understanding of the use of puppets—and play—far beyond early childhood education, for example, demonstrating its application in college foreign language classrooms. I wrote extensively on the nature of play and communication, [see Exhibits A - C NSF, Computers, Magnetic North, Principles]. In 1988 I won the support and friendship of Paul D. MacLean, now an Emeritus research scientist at NIH and one of the fathers of modern

neuroscience. Other world famous scientists opened their minds and laboratories to my quest, including the renowned Britton Chance (University of Pennsylvania School of Medicine); Nancy Dess, former head research scientist at the American Psychological Association; Frank Wilson (Stanford University, author of The Hand: How its Use Shapes the Brain, Language, and Human Culture; and Stuart Brown, MD, Ph.D. founder of The Institute for Play. See also Exhibit D.

I migrated the work with puppets into brain science and brain imaging, demonstrating that play behavior produced elevated levels of neuronal activity evidenced by increased flow of blood and oxygen in the brain. The Journal of Child Neurology and the Pediatric Academic Societies have both recognized the groundbreaking research, and the Center for Functional and Molecular Imaging at Georgetown University Medical Center has agreed to further this investigation into play which I have spearheaded. I accomplished this without formal academic affiliation, advanced degree, or funding from foundations or academic centers. I achieved these milestones as an inventor.

This year, 2004, after much effort of convincing educators and scientists that a folded piece of paper could grow exponentially and fractal into a systematic, symbolic world of communication, the Organization for Economic Cooperation and Development (a global consortium of 100 countries headquartered in Paris), <http://www.oecd.org> invited me to present theoretical and application papers to a symposium of 40 brain scientists from all over the world in Copenhagen, Denmark, November, 2004. [The Symposium Agenda and my Position Paper are Attached as Exhibit E]. My presentations are available on the Internet via download.

5. My invention is not readily comprehensible. In many ways it is as much a social invention as a composite of elements described. The harnessing of play presents a level of difficulty for the inventor as much as for the scientist. Play is hard to study scientifically and hard to harness technologically. Play is a very complex behavior that is hard to grasp and pin-down. The people for whom the invention is primarily intended—educators—have been the last group to grasp its usefulness and importance because the learning culture suppresses playful behavior. The invention is not a classical machine or technology composed of concrete physical proportion and components. It has taken more than thirty years for the ideas based on the physical hinge to ripen and to become respected. My invention has had to stand the test of time. Until now, the invention was often perceived as a generic arts and crafts variation on lots of

things seen on the education terrain. The **Puppetry Based Communication System, Method, and Internet Utility** is the product of many layers and generations. The amalgam of elements embodied in the present invention is far greater than the sum of its individual and deceptively simple parts. Although patents were previously obtained, they were facets of the later, and larger non-obvious invention—a system of play-based communication and dissemination.

The significance of the previous patents has been augmented by the emerging overarching purpose for which they were created, and by the fact and scope of its recognition. The **Puppetry Based Communication System, Method, and Internet Utility** should be judged in context of this recognition. Without the recent validation there is no perceived or recognized purpose; no recognition of play as a fundamental focus of brain science and the invention's value of a working model of applied science.

It is possible for someone to pick up a common object and discover unobvious and unique aspects, applications, and implications for its use. That is what has happened here. While it is true that the paper hinge and play and puppets were previously recognized and in some way disclosed, the combination of elements needed to be further revealed and then engineered. The visual, emotive, brain-based system of communication that is Puppetools represents an unobvious product that nobody could have predicted—even with the elements appearing now and then in isolated ways in the marketplace. While it is true that some aspects, including the hinge itself, as well as papers and generations of web sites explaining the nature of the project, were previously disclosed, the final picture of the invention and how it works and why it's important is only now coming into focus, and was not previously suggested. As I looked upon this common object for thirty years, I asked people to look with me, and, except for those teacher- and science-explorers who worked with me over the years, no one saw or grasped the implications. If nobody sees the value or its significance, the invention or idea (patented or not patented) is confined to obscurity. How great a leap the invention represents can be a liability. If it's too big a leap, few people see or grasp it. But if, as is the case here, the invention—as well as its significance—is suddenly recognized, not by a company with commercial interests, but by a representative group of scientists from many countries, then that should be considered an objective measure of the invention's validity and integrity.

The invention's use of puppetry is a dramatic leap beyond all previous puppet-based models, particularly one-way, TV-based entertainment models such as Sesame Street that use proprietary characters which children view passively. In contrast, the fruits of the present invention are delivered to individuals, using the web, for the primary purpose of full participation, and immediate access to brain research embodied in the use of puppet concepts and techniques. The flow of information engages users into action, communication, and play, and generates energy and information for applying and sustaining principles and practices of play. The information is directed, literally, into the communication pathways of users—into hand, mouth, and conversation of the individual. The use of the hand, now recognized as the biological mainspring for human speech and language, is foundational to human learning, internalizing, and articulating. A communication model that invites and calls on the use of the hand performs a function that conventional teaching methods, communication, and technology cannot because the tools that engage the hand in communication, beyond the commonplace stroke of key, are rarely adaptable to current methods and products. Patenting this process of communicative play will further solidify the foundation for its use and propagation in learning cultures throughout the world.

6. The invention impacts the world of text and images. Images that can be made to move off the page or monitor and into the hand convert the nature of content as we know it from something passive into something alive and interactive. The invention harnesses play energy, and is thereby able to change **classroom communication and thereby the learning culture in three resistant-hard-to-reform areas: communication, content, and behavior**. Play Language permeates the classroom like a drug that affects a specific part of the body. Play Language accesses the physiological pathways of communication—the Hand, Movement, Vocalization, and Symbolic Projection. By changing the nature of communication, classroom experience is lifted from its flat, one-way dimension into a shared, living experience.

7. No one before me glimpsed the combination of elements (from the interactive, paper-based communication system to its full representation as a web-based system of education; from a practical skill-building and skill-sharing community to a theory of puppet play). No one before me thought it important enough to take the highly complex behavior of puppet play and

transform it into a practical form of media with tools, skills, techniques and applications. No one before me saw that, without the web structure to further stabilize and make robust the fragile, complex, and elusive properties of puppet play, the process could not be practically established, systematized, exhibited, demonstrated, and shared within a community; could not exist, beyond entertainment, as a body of sustainable knowledge complete with a physical constellation of resources, tools, and users for future propagation. The invention of the video camera was also crucial. Videotaping made it possible to capture and record behavior that previously was not considered important enough to film, and which only presented itself in random, isolated instances of spontaneous play.

With its emerging capacity for streaming content, only the web could “capture” the fragile and highly elusive character of the ‘play process’ exploited by this invention. An invention so fragile—and the ideas supporting its use—could not ‘hold up’ without the web. People commonly post all kinds of information on the web. But the value the web is not to produce a digital version of the flat page, but to create something so innovative that it actually exists in part or whole because of the web—a unique entity that could not possibly exist without the web. Only the web can generate, demonstrate, propagate, and reciprocate communicative play energy into people’s hands and people’s lives. Today, web-based gaming, driven by play energy and communication among users, is a social and commercial force. The classroom experience, by contrast, remains insulated, inert and devoid of interactive, colorful, emotive, playful experience and communication. This invention could change that condition. The **Puppetry Based Communication System, Method, and Internet Utility** sits at the intersection of education and brain science. The Puppetools website, which houses a working model of applied brain science, directly contributes to knowledge gained from the last two decades of brain research, including emotional intelligence and the importance of the kinetic, visual-symbolic, gesturing, story-telling, speech and language centers involved in cognition—all behaviors studied, for example, at MIT’s brain science laboratories.

8. Science makes the ordinary extraordinary. It is the improbable and unobvious combination of these ordinary elements that supports patentability. When simple elements work together you can get emergent behavior. In other words, the system as a whole can be more complex and sophisticated than the simple bits that it’s made out of.

The invention harnesses play energy (a human resource hardly used but desperately needed in education culture), and makes it visible and practical to use. Moreover, the elements of the present invention make practical a unique, non-obvious application of puppet media that can effectively integrate play into the broad spectrum of education communication and products—as personal communication media, as universal, transnational language and soft technology. Increasingly, play is recognized as a scientific 'product', a behavior resulting from a fully differentiated and engaged state of mind. The invention generates and directs play into the flow of communication, altering the physical and psychological content, communication, and behavior in the classroom. The systematic use of paper to apply principles of brain science is not obvious. It represents a leap out of casual, random entertainment into a brain-based mass media platform.

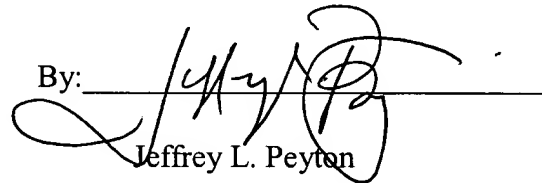
Transforming an amorphous art of many forms and materials into a systemized form of media is not obvious. This projected and actual engineering required of such transformation was never before attempted primarily because no one has ever seen the benefits or has asked 'what if'? Tied to the perceived judgment of my invention as "obvious" is the conventional perception of play as mere entertainment or amusement; and play, as this document asserts, is decidedly more than that. The OECD's invitation to present the invention to an audience of the world's brain scientists would suggest that, simple as it may seem, its existence is complex, unique, and unobvious.

9. It would be one thing to claim the **Puppetry Based Communication System, Method, and Internet Utility** in a vacuum, but established world scientists and a global organization have recognized the 'process of combined elements' claimed in the present invention. The invention, which incorporates all previous patents, represents an improvement over the previous patents; a 'communication currency' formulated on the systematic, demonstrated, and sustained use of paper to create a mass communication resource built upon principles of the learning sciences. As a model of applied brain science, puppet-based play language may be a significant advance in the history of education because it provides education with a vehicle for building knowledge and methods based on the natural propensities and needs of the human brain. If brain scientists from around the world, looking for models that can effectively transfer the fruits of brain science into the hands and heads of teachers around the world have recognized Puppetools as an important model of applied science, then there is something unobvious and patent-worthy about this invention. The OECD web site has posted an unsolicited description of Puppetools website and

the claimed invention as “a scientifically developed brain-based learning” model. Considering the scope of the work and the achievement that this recognition reflects, a patent is warranted if for no other reason than the invention can make it possible a quality of life in classrooms that until now, education by itself has not had the resources and capacity to create.

10. I declare that all statement made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: December 28, 2004

By: 
Jeffrey L. Peyton

"Magnetic North:"

Setting A Course For Publishing & Education Reform

By Jeffrey L. Peyton

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The Evolution of Education

"We go hunting for a little animal whose name we don't know, so we call it "X". When we bag our game we pounce on it and give it its right name."

These words are ascribed to Albert Einstein's Uncle Jakob who played with math ideas. In many of Einstein's later attempts to present the theory of relativity to non-mathematicians, there is recourse to different analogies such as elevators, trains, and ships.

Is it reasonable to hope for an "x"—a single element—to bring about a fundamental change in the way we educate our children? Is it possible for a host of educational problems and inconsistencies to be solved with a comprehensive vision in the same way Einstein attempted to unify our understanding of the physical world with a single theory? Einstein biographer Ronald W. Clark posed the question as to what our world today would look like if Einstein had become involved with problems concerning the social universe.

If an all-encompassing innovation in education were possible, what form would it take? Ball bearings were invented to facilitate movement between physical objects. Scientists view superconductors as potential technology that will reduce the need for energy to run modern machines. But social and educational problems cannot be solved by machines but perhaps by insight into the nature of things. Whatever you want to call it, and however you choose to perceive it, the impact of an Einsteinian super-x on the field of education must be dramatic and all-encompassing.

Let's engage in a little scientific "what if" thinking. Just for argument's sake, let's say that the Puppetools innovation of "play language," along with its patented "publishing utilities, represent "X".

"X" = NATURE'S TEACHING MEDIA: the ancient hand puppet—recast into a modern media form. The device constitutes a high-touch technology that systematically facilitates a flow of physical media, whether in single or multiple units. This process of transmission and communication constitutes a "limbic brain language." Use of this language has been shown to exert significant change in the internal and external learning universe of the traditional classroom.

Preconditions for the Emergence of X

1. "Our society is desperately in need of individuals who are able to look at the old and familiar in startling new ways," wrote Ernest L. Boyer, former President of the Carnegie Foundation for the Advancement of Teaching. Educational reformer and play theorist, Jeffrey L. Peyton has discovered untapped elements in a familiar art and artifacts. Mr. Peyton is the architect of Puppetools, a learning language based on the need to communicate through play.
2. Children must love and accept x unconditionally. It must be a life force that children would adopt if they could as an enduring true and loyal advocate; a Peter Pan that symbolizes adventure and playfulness, and whose spirit is sure to follow children through their intellectual, moral, and spiritual development.
3. X must possess a demonstrated capacity to create change at virtually every level of education, from preschool to college-level language courses, requiring only human involvement and economical materials common to the everyday educational landscape. Generally, a broad application of x would expand what we know about learning and child development. It would inhibit violence and boredom. It would open doors to hands-on activity, individual exploration, and self-expression while promoting a bond between children and adults. It would enhance the motivational drive to learn both in the child and the adult. The physical and non-physical qualities of X are described below.

Operating Characteristics of X

- **Physical Form:** X physically enables ideas to spring to life in the hands of their originators. X is a lifelike, handheld, symbolic representation of the ever-changing, external world and of the perceived or imagined world of the internal brain. X is a technology capable of bringing the larger world into the classroom—and into the

palm of the hand. X brings the world of content, curriculum, book illustrations, subjects, images and symbols into the hand. X personifies the world as both image and concept.

- **Change Agent:** Like a vaccine, X is literally placed inside host forms to effect change. X alters adult perceptions and the adult way of working with and presenting information. It engages children and captures their attention at all levels of development. It transforms teachers from tellers to modelers and enactors, from judges and testers to coaches, players, and co-explorers. X helps adults respond to the learning interests naturally found in children, and assists the adult in guiding and directing classroom attention and energy, not unlike a conductor directs an orchestra. X invites quiet children to be active, active children to be focused and reflective, and aggressive children to experience alternative behavior. In the adult, x invites what children need most at the heart of learning: playful adult partners who guide their self-discovery. X works in virtually any arena as an antidote to the traditional procedures and policies that daily run counter to common sense and to the inalienable rights and dignity of children and teachers.
- **Neurophysiological Link:** While x has been most readily understood as an art, its nature and purpose is to mirror the needs and requirements of the brain. Use of x comprehensively answers the calls for change and demonstrates findings in the major, current research on learning, learning styles, and brain function. In its ability to integrate the body, emotions, ideas, and imagination and to humanize communication, the process of x is unparalleled. X calls upon and stimulates visual, emotive, verbal and nonverbal activity in both adult and child. Inherent in its use is a measurable dynamic, a chemistry, and a physical power that can fill the institutional void we have made of education. Whereas computers have been described as artificial brains, x may be compared to a unique controller and facilitator of the "brain's software;" a device which may be used to induce behavior that emanates from the brain's limbic cortex. Such behavior includes the capacity to feel, to care, to play, and to develop a sense of self.

A Digression: Predicted Impact of X on Book Function and Design

Imagine it is the year 2050. The effects and benefits of x have been carried and transmitted through books. As a result, the book—the familiar artifact that lines the shelves of our libraries, dens, and bookstores—has undergone a cultural metamorphosis—books have grown an auxiliary pocket for the hand. While the book's overall design has not changed, its use, and meaning has changed as a result of a simple addition. Some believed that the "computer book" or the laser disc would become the next big thing in publishing. However, a new kind of "soft media" set the stage for the next

step in book evolution. A simple utility changed the way books, computers and other media related to child development, education and entertainment were used and perceived by consumers. Books took on an extended life in the hands and in the eyes of the user.

- Books were said to "touch" our lives in the past, but the evolution of x allowed them literally to change our lives.
- Whereas reading a book was largely a silent, passive, or an active, lap-or desk-bound practice, its evolution led to routine reading experiences that became playful, social, interactive, expressive and animated.
- As reading evolved into a "heightened experience," books became more meaningful and memorable as an inner experience. For children the reading of a book now took on larger-than-life qualities and fostered imaginative play. With x the book literally came to life, making adults—in an era of high-tech obsession—better communicators and kids better listeners.
- As x became accessible quickly to large numbers of the reading population, educators quickly picked up on its playful process. The benefits of this new activity awakened educators to augment the use of nature's fundamental guide and motivator in teaching and learning: *the process of human play.*
- Children and adults could now talk to book characters, who in turn talked back to them in a world of spontaneous dialogues and interviews. The traditional grade-school book review became an experience in which book characters, quite literally, spoke for themselves. If storybook figures and illustrations could spring to life in the hand, then a new phase in the evolution of puppet media—and book design—was possible.

Research and Development

The development of X stems from several basic questions raised initially by Jeffrey Peyton:

- What drives the unconditional response that children show for puppets?
- Why do teachers often exempt themselves from the fun and the possibility of using the medium?
- *Given the unique power of the medium, how could its communication and socializing qualities be mainstreamed?*

Peyton saw a powerful teaching chemistry going to waste. Children crave the imaginative interplay that puppets bring to their world. Why, then, shouldn't it be a regular part of their everyday classroom "work" experience? And

shouldn't teachers increase the opportunity to feel creatively "in sync" with their students?

Peyton found that, although teachers know that children love puppets, they considered the medium impractical. They harbored myths, reinforced by popular TV models, that using puppets requires special theater know-how, scripts, extra time, theaters and fancy puppets. "My kids would never go for it, and, anyway, I could never pull it off," was a common refrain.

Peyton's research uncovered more questions:

Q. If puppets are to achieve the universal status of classroom chalk—routinely picked up by teachers to ask questions or make a point—what sort of puppetry would it be?

A. It would call for puppets used right out front, like a telephone or a microphone. It wouldn't matter if kids could see whoever was making the puppet talk. And it would require that puppets evolve from a common resource such as paper.

Q. How would large numbers of teachers view puppets as a mainstream teaching medium?

A. It would be necessary to introduce a new model for using puppets. The model would dispel negative myths, especially one of the biggest myths about using puppets: fancy puppets are required.

Paper + Puppets = Miracle Media

In order to maximize the benefits of the medium, Peyton focused on a staple that is common to all classrooms: paper.

By linking the medium of puppets with construction paper, teachers could quickly bring any subject to life. The use of paper made it possible for the puppet medium to become as universal as paper itself. Using paper moved the puppet medium into the realm of printing presses and die-cutting. If—through puppets—book figures and illustrations could spring to life in the hand, then a new phase in the evolution of puppet media—and book design—was possible.

But the most important discovery of all was easy to overlook: children readily talk to or through paper puppet forms.

Initially, many teachers express doubt that puppets—especially paper puppets—can elicit a significant response from children of varying age, background, and ability. Teachers simply believe that children are too

sophisticated to take puppets seriously. But they quickly discover that the real "sophistication" of children lies in their capacity to suspend literal reality and use imagination.

Whether second grade, sixth grade, or college-level Spanish, the element of play, facilitated by a simple paper puppet, stimulates and engages the classroom. This isn't a puppet magic trick. Rather, it indicates that kids are naturally willing to talk to and play along with paper puppets made either by themselves or their teachers.

If any magic can be found, it is in the puppet's capacity to motivate the adult to meet students halfway—and play. Puppetools has consistently broken through the skepticism, and has excited teachers unfamiliar with the puppet medium.

They discover in paper a "miracle media: "I don't think I could quit using puppets even if I wanted to. "Diane" has been part of our spelling lessons all week and today I started without her. "Where's Diane?" I heard three different students ask. I couldn't believe it was one of my tough guys. I can't believe the attitude of my students. They are different. They are excited. I am excited. I can hardly believe that a paper puppet can be so magical. Thank you. I feel you've handed me a very special gift.

This gift was paper which the teacher herself had cut, folded, and applied in a new, creative way. Even more important, the gift conferred creative power. It caused an awakening.

Combining puppets with paper is a formula for unleashing the vast reservoir of creative talent in teachers. The successful promotion of this concept is capable of producing a "powershift" in the way educational consumers view themselves and the materials they purchase. If paper can be shown to possess magical, extra-intelligent properties, then a popular "love affair" with paper is possible.

Peyton became convinced that teachers were missing out on getting such responsiveness from kids. In 1973 he received \$25,000 in a series of grants from the New Haven Foundation to conduct three years of teacher training seminars in the New Haven Public School System. In 1977 Instructor magazine featured his work in an article that generated 10,000 responses from teachers all over the world. After almost 20 years of research, trial and error, a consistent picture has slowly come into focus—what makes kids tick, what makes up their learning needs—emotional needs that teachers can respond to by using puppets. It was also clear that using puppets drew teachers further into the excitement of teaching. It also offered, through

creative confrontation and dialogue, a way for educators to surmount many obstacles to learning—cultural and language diversity, learning disabilities, and social problems. As of this date, through training workshops, seminars, and sales of the working text, thousands of teachers have participated in the program that has become known as Puppetools.

In 1985, *Puppetools: Introductory Guide & Specialized Applications Manual*, was published. Combining theory and practice, the manual established a theoretical foundation for the use of puppet media. The Carnegie Foundation for the Advancement of Teaching recognized the work as an "important contribution to the art of teaching." In 1986 the first of 3 utility patents and 11 design patents was acquired. In 1990 Peyton was invited to present seminars and to read papers at the world conference of the International Association of the Child's Right to Play, in Tokyo. He declined the invitation for lack of funds.

From Puppets to Play Language

The importance of play was recognized by the ancients. Heraclitus wrote, "Man is most nearly himself when he achieves the seriousness of a child at play." As Eastern thought has recognized for centuries, true experts play with their knowledge and skill. Throughout history, puppets have played a key role as a tool that uniquely symbolizes human play.

With the new perspective that puppets were technology speedily assembled, literally picked up and used, hesitant adults were suddenly using puppets. Teachers discovered that they did not have to perform when using puppets. Using a puppet could be a "technical" experience; rather like using a telephone or a microphone. It was a device that enabled the user to filter, amplify, exaggerate, accentuate, and direct messages with greater command of attention.

On the basis of hundreds of informal teacher reports, observations and evaluations, a view was emerging that suggested that the affective qualities induced by puppet-use *were possibly the result of a natural process.*

Whereas children sometimes perceived learning as a threat, the natural, informal play with the puppet was self-revealing and self-motivating. While teachers-as-adults were often overpowering to children, children perceived teachers using puppets as the "right size." In using the puppet, the adult crossed over the adult-child dividing line and became one of them. Was it is largely for this reason that puppets appeared to significantly reduce learning fear and anxiety in children? Puppets had a healing and bonding influence. They allowed children and adults to reveal themselves in a safe, creative

way. When teachers found themselves having fun, they became models for learning in themselves.

Teachers using puppets became more perceptive and sensitive to the learning needs of children. One teacher wrote, *"I can't tell you how wonderful it was. My students fell in love at first sight. My room worked quietly and harmoniously for the first time. Three boys, who stay to themselves, smiled and responded to her with love and tenderness (they hugged her good-bye). The whole day was like living a wonderful dream. I saw a side of my students I will never forget."*

Information and communication technology embodied in the computer is known to create a language of its own as it first carves a trail through society and then settles in. The same can be said for the new paper media in that it comprises a personal, visual, emotive, interactive yet systematic language of symbols and images that enhances the experience of whoever it touches and the effectiveness of whatever it touches. A large percentage of educational activity is experienced through language. Education is still a business in which the use of words generally leads to more words. A new language that radically motivates people to shift away from use of the old language is called for. The new language calls upon the speaker to make a full scale leap from the old world to the new world.

Unlike the language of mere words, the handheld language synthesizes, integrates, and individualizes knowledge; centers the pursuit of learning properly within the individual child. The new language increases greater human response and participation in both student and teacher—hands, eyes, voice, minds, emotions and the spirit.

This is a language of spontaneously handcrafted tools and handheld ideas—a working model of innovation whose power is immediately understood and appreciated by those who work with children.

This is a language inherently familiar to every member of the population by virtue of early childhood play experience. A national resource, the language of childhood is the river of ancestral knowledge. Fed by ancient wellsprings in our humanity, this language flows out of the one human activity that is known to represent our species at its best: the behavior of play.

Scientific Foundations

Although much has been written about play in education, schools have done little to capitalize on its importance. Trends indicate that more experiential, child-centered approaches to learning are emerging, but whether school bureaucracy can loosen up enough to practically accommodate this trend is doubtful. Education remains an archaic, ineffectual system in which control and bureaucratic convenience—not the playful interrelationships of people, knowledge, and ideas—is paramount.

Play offers an antidote to the toxins that have built up within the system. In a world driven by images and more and more by the pulse of communication and global contact, the introduction of a universal play language would contribute significantly to society and human learning.

Play is a force of nature. The invention of play language dramatically brings to light the significance of research which has recently established play behavior as the evolutionary taproot of human learning. The research, conducted at the National Institutes of Health by Paul D. MacLean, has been published in a 700 page study, *The Triune Brain in Evolution* (Plenum Press, 1990). MacLean is senior research scientist emeritus in the department of neurophysiology at the National Institutes of Health in Bethesda, Maryland. MacLean's work may seem far removed from the practical realities of the classroom, but in terms of cultural self-knowledge it has important implications for the future of education.

According to MacLean, the characteristics that set mammals apart from reptiles along a new evolutionary path are nursing (maternal care), the separation call, and play. These changes, says MacLean, set the stage for the emergence of mammalian family structures. What made these changes possible was the emergence of the limbic cortex in brain evolution. This brain structure amounted to a social invention that empowered mammals to nurture, *communicate, and play.

The development of play behavior in mammals, MacLean shows, served to promote emotional warmth and harmony in the nest and then subsequently social affiliation. That children learn most naturally through play is directly attributable to the limbic brain. In his study, MacLean paints an intricately detailed mural of our paleocerebral heritage in which we discover in mammals the emergence of vocalization, right handed dominance, nurturing, nursing, and playfulness; in humans we see the evolutionary basis for family structures, ethics, and the manipulation and development of media and tools. Against this backdrop emerge human skills leading to higher order thinking, math, prediction, art, and design.

"In view of the prominence of play among mammals," writes MacLean, "and its civilizing influence in human evolution, it is curious that it has received so little attention in neurobehavioral research. In one handbook of experimental psychology, for example, the subject of play is dealt with in less than a page, and in a three-volume handbook of neurophysiology, there is no reference to play."

MacLean's research constitutes the discovery of a "magnetic north" on the compass of human development. MacLean has given us a true point of reference scientifically rooted in the nature of things to use in plotting the future course of education. MacLean has shown us that biology may be our destiny; that evolution has directed itself at times along divergent paths to create animals oriented to the air and others oriented to care. By grasping the essential order and function of the apparatus that has made us what we are, we may better glimpse what, in an enlightened future, we can yet become.

Unfortunately, MacLean's work is an extensive, highly technical body of scientific knowledge with no visible means of distinguishing itself from hundreds of other scientific tomes, published and unpublished. More books about play will be written and published, and some educators will surely read them. Given these glacial movements, the benefits of MacLean's research could take years to trickle down into the schools and the curriculum. *But this is the age of mass media*; a technology appropriately found in nature is at hand to tap this powerful, internal human resource and move it quickly and economically into the marketplace.

Play Language offers the means to effect a broad application of MacLean's science. The invention could help put world education on a track consistent with our evolutionary heritage, and help set a course that is more consistent with society's truest educational needs and nature. A media that can inject large doses of the play element into society, that has a unique track record in education, and has proven its effectiveness as a tool for teaching and educational reform should be considered a secret weapon by research and development publishing departments looking for ways to psychologically, visually, and experientially add to their products. A root change in education is desperately needed. A mechanism that facilitates root changes in language and behavior, while adapting to basic material such as paper and books, is a tool whose time has come.

Educational Reform Via Bio-Media

To speak of educational reform is to aim tools of transformation at the nerve centers of education: at the source of language, communication, and behavior. The tool described here adapts easily and economically to the

commonly used tools of education. The publishing industry is naturally poised—and by virtue of this new invention—best equipped to engineer such a plan.

"There are certain callings in our modern organization," wrote Einstein, "which entail such an isolated life without making a great claim on bodily and intellectual effort. I think of such occupations as the services in lighthouses and lightships. Would it not be possible to fill such places with young people who wish to think out scientific problems especially of a mathematical or philosophical nature? In this way, perhaps, a greater number of creative individuals could be given an opportunity for mental development than is possible at present. In these times of economic depression and political upheaval such considerations seem to be worth attention."

When the play impulse is finally understood and grasped by large segments of the population, Einstein's idea of a place for reflection and exploration will not take the form of a lighthouse. Instead, it will be an ongoing cascade of media experiences that facilitate growth in the collective mind and imagination. The publishing industry, an image-conscious, creative engine of ideas, has served a bureaucratic, institutionalized education market that has been largely reluctant to play.

The publishing industry is in a position to give education the media-ride of its life. To do this would not require the hard-sell task of convincing educators to embrace the value of puppets as teaching media. Rather, simply by making the new media accessible in books and related programs, almost as an afterthought, will provide a mass "utility" effect with direct access to the "phone."

The fact that the paper media naturally changes form and function from single to multiple units, from a media form into a language, and from a language into a technology, indicates that it can be used to facilitate change in the collective consciousness. The principles of Marshall McLuhan, the media visionary, correctly described certain media forms as being both a message and a *massage*. Based on its performance in the hands of classroom teachers, nothing could describe the nonverbal dynamics of the Puppetools invention more precisely in its ability to impact and transform large, institutional sections of our society.

A utility that can place in the human hand a visual language of images, emotions, and that can literally touch and nurture the populace in ways that other media cannot is a development that cannot be ignored. Books equipped with this media would become a vehicle for mainstreaming higher

levels of creative interaction and play. No process would deliver the message of play more effectively across the populace than by making its most natural, physical embodiment—the hand puppet—a standard utility in storybooks and learning programs.

The publishing industry, society's institutional gate-keeper of ideas, has a unique opportunity to play a key role in facilitating such a breakthrough—and becoming a major beneficiary. The broad education arena served by publishing can be primed to grow in exponential leaps as we near the gateway to the third millennium.

The Utility= X

Our algebraic X is of course a simple, technological twist of the world's oldest media form, the hand puppet. Nevertheless, the little tool has the capability to do for modern publishing what Johann Guttenberg's moveable type did for book printing in the 1440s. Not only does this media system deliver information and entertain, its primary chemical composition also makes it a rare kind of social superconductor; a medium of human nature that enhances language, behavior, and communication. The new media form constitutes a soft technology upon which a higher, humanizing literacy can be fostered and promoted, with important social and commercial benefits.

The invention is a patented hinge of folded paper upon which the graphic subject of a book's art work is affixed. The resulting Paper Talker® medium is a systematic, hand-held, interactive communications device. Made from one sheet of folded paper, the mechanism allows the assembled character to move its mouth. The mechanism triggers simultaneous hand action and oral expressiveness, and invites playfulness and interaction. Several in-book installations of the media form are possible.

A basic back-page book applications, plus 2 options, are described below: On the back page, a frontal black and white illustration or simple line art, broken down into two parts (upper face and lower face) is provided. The illustration is photocopied; photocopy is then colored by the user. The copy is cut out and its two pieces are applied to the patented hinge to make a talking character. (A piece of light cardboard backing adds durability to the affixed image.)

A full color illustration could be photocopied or cut from the page and used as is. Varying the size of the image and the hinge is also possible. A puppet whose parts and features are die-cut and assembled like a puzzle.

This process has been described as an "American Origami." As a craft component, the die-cut design has excellent applications for publishers of educational texts and curriculum programs.

Manufacturing Requirements

Incorporating this technology only requires adding one or, at most, several pages as desired containing the frontal art to retrofit existing books or to equip future books. In certain cases, only one extra page would be needed to carry the photocopiable puppet parts, plus a standard sidebar depicting visual directions for folding the hinge and attaching the parts, and suggestions for using the puppet.

History and Trends

The invention has emerged concurrent with these important market trends and developments:

- a renewed interest in "toys that teach" and provide hands-on experiences.
- print advertising and published products that include a three-dimensional component.
- an interest in books that are accompanied by a hands-on product including tapes, plush animals, juggling bags, jump ropes.
- an established expectation within our culture for interactive, image-related fun driven in part by the entertainment licensing industry.

Pairing literature with an interactive component is hardly new. It is a practice that is said to date back to John Newbery, the 18th Century English publisher for which the Newbery Medal is named. Newbery wrote religious books, and he often packaged them with a ball and jacks. While there are numerous examples of books that are published along with toys, publishers are wary about doing this.

The following table compares the traditional book-toy model with the Paper Technology.

Traditional Book-Toy Model

Packaging is a costly and critical factor. The toy-book combination has to be considered on a case by case basis. Plush toys are all different, costly to design, and are usually included to add interest and value to the product. Often, the add-on product may resemble a character in the book, but the book's illustration must underdoo

Paper Technology

The paper technology systematically delivers all book images into the hand of the consumer, adult and child alike. It integrates economically into the book (no extra baggage, minimal cost). The technology provides an economical communication utility

modification to fit another non-book medium. Publishers are not inclined to use an add-on toy unless the character is famous. The plush toy is appealing, but lacks systematic predictability and function.

that is easily constructed and duplicated by the consumer. This component extends and expands the perceived use and intrinsic value of the book for individual and group use and participation, giving the book a built-in functional message of play and communication.

Sending a signal that interactive play is consistent with the book's original purpose extends the educational, literate quality of the book.

Unlike plush book toys, the paper device retains the integrity of the printed art, and remains suitable for manufacturing and mass consumption.

The invention solves the potential problem of toy product liability.

The invention solves the problem of expensive packaging; spine-out retail display remains a practical option.

It enables add-on product marketing that does not engulf the book as the primary product of publishing.

The invention adds a brand new feature to all books that is potentially as basic and beneficial to the book's life as the binding itself.

A Revolutionary Role for Publishing

By adopting high-touch technology, the role of books, and their perceived importance in an increasingly high-touch universe, is both broadened and deepened within our society. The message conveyed is that book characters can talk, be interviewed and interact in the hands of the reader.

A new language is introduced through a utility that integrally adapts to the fundamental cultural repository of the book. This capability enables the tool to be widely and quickly disseminated as a language throughout society, and thus becomes a superconductor of a literacy even more fundamental than

that of reading itself, a form of play literacy that will enhance reading literacy in the families and classrooms of our society.

Publishing leaders are now in a position to install a utility that could have a revolutionary impact on society. Books are poised to become a pivotal player in society's transition from an authoritarian, bureaucratic kingdom to a land in which people educate themselves, discover strengths in themselves, are better and more empathetic communicators, see the world as a place of endless ideas and opportunities to be re-made and re-invented, treat one another with openness and respect, and in which fear and violence are erasable because the formative experiences of play have been made a part of a new emerging world.

As pre-2000 society drifts inexorably toward a high-tech future, the publishing industry can lay undisputed claim to that world, once and for all, as the uncontested foundation to human learning. The book publishing industry can move to block the formation of a dominant high-tech destiny. It will require collective action—and a bold industrial maneuver to move books to a higher level of perceived value and function. This call for action is based in part on the aforementioned scientific evidence that high-tech products have inherent limitations as a humanizing influence—a fact which implies great opportunity.

National Industrial Strategy

While a universal application of the invention is implied, it is very much a social invention in the American tradition. The spirit of American know-how is rooted deep within our constitution, our cultural identity and our way of life. We Americans live in a "social experiment." The founding fathers hammered out a mechanism to create desired social outcomes. In America social inventions—initiatives taken to better our social well-being—represent our cultural heritage. Examples of this sort of American engineering abound. By adopting a similar mechanism, the publishing industry has the power to affect the course of education.

Given such an opportunity, the industry can ill afford to treat it casually. "In the world economy," writes John Naisbitt, "education is the Pacific Rim's competitive edge. In the new economic order, the countries that invest most in education will be the most competitive." Indeed, before too long what is now a pressing option may become a matter of national security as our education produces large numbers of illiterate and unproductive citizens.

In order to survive, the great institutions of our society may have to take risks and initiatives. The opportunity, then, requires the courage to cause an event to occur—an event of sweeping change that will open the door to a

new stage of development in the evolution of books as a cultural transmitter of values, experience, and information. By opening the door to play language, the publishing industry will establish itself as a leading facilitator of educational reform. Here, then, is an opportunity to make something happen of historic scale and significance in the industry and regions of society it directly affects. As the education field's sister market and primary source of information and materials, the publishing industry has an opportunity to enhance the role of books and thereby gain an edge in the global education market—a crucial center of economic activity.

The adoption of the utility company by company would be a piecemeal approach that reduces the overall opportunity to create a major, sustained impact on society. If the industry becomes convinced of the tool's efficacy and its overall benefits, it stands to make the adaptation and implementation a success if collective involvement and support of the medium is demonstrated. This would require a decision to pursue an active leadership role in shaping the market it serves.

The foundational place of the Book as Artifact can be infinitely strengthened in its ability to transmit culture and information. Not only will its role in the hands of people be made more entertaining and powerful, but it can now assume a more active and interactive role in changing a variety of behaviors in readers and users of books.

Indeed, as the scientific roots of this concept suggest, the book's role in the future will offer a kind of interactive experience that not even computers or laser disc technology can offer, namely the spontaneous generation and regeneration of high-touch opportunities for human communication, rapport and relatedness. The message that will be conveyed by this unique juxtaposition of media/book form is that "everybody plays" and that play is paramount.

In a culture presently fraught with conflict, competition, negative images, unexpressed feelings, unfriendly learning environments, and adults who need to use more play in the way they work with children, an appropriate mechanism that encourages people to play in their reading and learning will have a dramatically healing and ameliorative effect on our culture.

Mary Had A Little Lamb Her fleece was white as snow. And everywhere that Mary went Her lamb was sure to go. It followed her to school one day. It was against the rules. It made the children laugh and play To see a lamb at school.

These are regarded as the best known four lines of verse in the English Language. And the words "Mary had a little lamb," spoken by Thomas Edison on November 20, 1877, into his latest invention, the phonograph, were the first words of recorded human speech. Fortunately there is no ambiguity surrounding the authorship of this tale, in which a girl is followed to school by a lamb "that makes the children laugh and play." The words capture an actual incident, recorded in verse in 1830 by Mrs. Sarah Josepha Hale of Boston, editor of the widely read Ladies' Magazine. Mrs. Hale (who launched a one-woman crusade to nationalize Thanksgiving Day) was also editor of Juvenile Miscellany. When she was told of a case in which a pet lamb followed its young owner into a country schoolhouse, she composed the rhyme and published it in the September-October 1830 issue of the children's journal.

—Charles Panati
Extraordinary Origins of Everyday Things

Synopsis of US Patent 4,555,236 (Paper Talker®, Publishing Utility)

A play media that delivers to the human hand a visual language of image and emotions, and which can reach and humanize the populace in deep ways that other media cannot is a development that has important implications. Books equipped with communicative play media become vehicles for mainstreaming higher levels of creative interaction and emotive communication. No process would deliver the "massage" of play more effectively into the collective hand of society than one that made its most natural, physical embodiment—the hand puppet—a standard utility in storybooks and learning programs. J.P.

Predicted Impact of the Invention on Book Function and Design

Imagine it is the year 2020.

The familiar rectangle-shaped artifact that lines the shelves of libraries, dens, and bookstores, has undergone a cultural metamorphosis. Some believed that the "computer book" or the laser disc would become publishing's wave of the future. However, a new kind of "soft media" set the stage for the next step in book evolution. A simple utility changed the way that books related education and entertainment were used and perceived by consumers. Books took on an extended life in the hands and in the eyes of the user. If books were said to "touch" our lives in the past, the invention allowed books, quite literally, to change our lives.

- Whereas reading a book was once largely a silent, passive, or an active, lap-or desk-bound practice, routine reading experiences became playful, social, interactive, expressive and animated.
- As reading evolved into a more heightened experience, books became more meaningful and memorable. For children the reading of a book now took on larger-than-life qualities and fostered imaginative play. The book literally came to life, making adults better storytellers and kids better listeners. Books humanized human communication to a degree they had never before.
- As communicative play became accessible to large numbers of the reading population, educators quickly picked up on its playful process. The benefits of this new activity awakened educators to the power of nature's fundamental guide and motivator in teaching and learning: the effect of human play.
- Children and adults could now talk to book characters, who in turn talked back to them in a world of spontaneous dialogues and interviews. The traditional grade-school book review became an experience in which book characters, quite literally, spoke for themselves.

The principles of Marshall McLuhan, the media visionary, correctly described certain media forms as being both a "massage" and a message. Nothing could describe the dynamics of the invention more precisely in its ability to impact and transform broad, institutional sections of our society.

The Here & Now

US Patent 4,555,236 is a simple, technological twist of the world's oldest media form—the hand puppet. Nevertheless, the little tool has the capability to do for modern publishing what Johann Guttenberg's moveable type did for book printing in the 1440s. Not only does this media system entertain and deliver information, but its primary chemical composition also makes it a rare kind of social superconductor—a medium of human nature that enhances language, behavior, and communication. The new media form constitutes a soft technology upon which a higher, humanizing literacy can be introduced and promoted, with important social and commercial benefits. The publishing industry has a unique opportunity to play a key role in facilitating such a breakthrough—and becoming a major beneficiary. The broad education and family market served by publishing can be primed to grow in exponential leaps into the next millennium.

As brain science becomes education mainstream, publishers of educational programs will re-tool and rethink traditional approaches to program and product design. Moving the medium of puppetry from TV and entertainment directly into the hands of the consumer as well as the classroom capitalizes on paper as a “communication currency,” a development that broadly impacts the market in many ways.

The Add-on Factor

Pairing books with an interactive component is not new. It is a practice that is said to date back to John Newbery, the 18th Century English publisher for which the Newbery Medal is named. Newbery wrote religious books, and he often packaged them with a ball and jacks. While there are numerous examples of books that are published along with toys, publishers remain wary. Packaging is a critical, costly factor. The toy-book combination has to be considered on a case-by-case basis. Second, plush toys are all different, costly to design, and are usually included to add interest and value to the product. The plush animal may suggest a kind of furry function, but it's more apt to end up collecting dust. Often, the add-on product may resemble a character in the book, but the book's illustration must undergo modification to fit another non-book medium. Publishers are not inclined to use an add-on toy unless the character is famous.

Nevertheless, trends in the marketplace point to a growing hands-on relationship with books fueled by an established expectation within our culture for interactive, image-related fun. The invention, which uses paper, integrates puppet media into books and related products. This approach offers many advantages and benefits over traditional plush toys that are marketed with books.

The following table compares the traditional book-toy model with the Paper Technology.

Traditional Book-Toy Model

Packaging is a costly and critical factor. The toy-book combination has to be considered on a case-by-case basis.

1. Plush toys are all different, costly to design, and are usually included to add interest and value to the product. Often, the add-on product may resemble a character in the book, but the book's illustration must undergo modification to fit another non-book medium. Publishers are not inclined to use an add-on toy unless the character is famous. The plush toy is appealing, but lacks systematic predictability and function.

Paper Technology

1. The paper technology systematically delivers all book images into the hand of the consumer, adult and child alike.
2. It integrates economically into the book (no extra baggage, minimal cost).
3. The technology provides an economical communication utility that is easily constructed and duplicated by the consumer.
4. This component extends and expands the perceived use and intrinsic value of the book for individual and group participation, coding the book with a built-in functional message of play and communication.
5. Sending a signal that interactive play is consistent with the book's original purpose extends the educational, literate quality of the book.
6. Unlike plush book toys, the paper device retains the integrity of the original, printed art, and remains suitable for manufacturing and mass consumption.
7. The invention solves the potential problem of toy product liability.
8. The invention solves the problem of expensive packaging; spine-out retail display remains a practical option.
9. It enables add-on product marketing that does not engulf the book as the primary product of publishing.
10. The invention adds a brand new feature to all books that is potentially as basic and beneficial to the book's life as the binding itself.

Technical Description of The Utility

The Paper Talker® Puppet invention is a patented hinge made of a single sheet of folded paper upon which the graphic subject of a book's artwork is affixed. The resulting Paper Talker® medium is an interactive, hand-held communications device. The mechanism allows the assembled character to move its mouth, an action that invites and facilitates in the user simultaneous hand action, oral expressiveness, playfulness and interaction. [Click here to see samples of hand produced paper puppets.](#)

Back Page Photocopy Treatment

Several back-page book presentations of the media form are possible. The simplest approach is to provide a black and white frontal illustration—line art—which is photocopied and then colored by the user. The copy is cut out and applied to light cardboard to add durability to the cut-out image. The cardboard-reinforced image is affixed to the hinge to make a talking character. An optional color illustration could be photocopied, or cut from the page and used without photocopying. Image and hinge size may be varied. Incorporating this technology only requires adding one or, at most, several pages containing the frontal art to retrofit existing books or to equip future books. In certain books, only one extra page would be needed to carry the photocopyable puppet parts, directions for folding the patented hinge and attaching the parts, and suggestions for using the puppet.

- | | |
|---------------|-----------|
| 1. Photocopy | 2. Glue |
| 3. Color | 4. Cut |
| 5. Fold Hinge | 6. Attach |

Craft Treatment

Puppet parts and features may be die-cut and assembled —like a puzzle. As a craft component, the die-cut alternative offers excellent applications for publishers of educational texts and curriculum programs.

Exhibit B

An Analysis Of The Qualities In Puppets

By Jeffrey L. Peyton

Not unlike the sun, or the air or the energy resources we use to heat our homes, puppets contain certain elements that make them a unique and highly consumable educational resource. Working together - sometimes all at once or sometimes just one at a time—these elements combine to make up a rich and powerful medium. If used correctly, the efficiency of a resource is increased.

People who use puppets are like chemists who uncover a new element, the isolation of which takes us one step further in helping us understand the world. The therapist who suddenly realizes that a child has responded to her because it mattered deeply to the child just to be able to hold the puppet (something three-dimensional) in his hand to help overcome his shyness, and then suddenly asks the same puppet a question to direct the child's attention away from his self-consciousness, is applying a knowledge of puppetry's basic elements.

This puppet power is often glossed over or taken for granted. After all, a puppet can just be a puppet; a no-account castaway plaything. But a puppet makes magic the way a musical instrument makes notes. We can learn how puppets do what they do by examining them—and ourselves—more closely.

1. Puppets Are Three-Dimensional

A puppet is a three-dimensional communications tool. But it is different from a book or any other learning prop, ~~mainly because a puppet is connected~~ personally to the user. It is not an abstraction, but a product of the imagination that can immediately command the attention and emotions of those whom the puppet involves. This three-dimensional quality in puppets accounts for their effectiveness as teaching and communications tools.

A puppet can therefore be hand-held, touched, hugged, and stroked. It can be used as a pointer to catch, maintain and direct the attention of those watching. Because puppets are three-dimensional, they can also be grasped and moved quickly.

Puppets, conducting energy like electrical wire, carry and transmit feelings. They are agents of nature. They are, literally and figuratively, a "size" that children can relate to. They feel good in the hand of a confident user; and appear fun and appealing in the eye of the beholder. While tapes, film, and television can hold the viewing attention of adults or children at varying levels of involvement, the puppet at work can reach within and transform a "viewer" into a participant; can neutralize the casual, passive consumption of the TV-trance into active and aware experience.

It can do such things because the puppet requires the involvement of the user in a variety of ways. Perhaps the most dynamic example of that involvement is illustrated by the simple fact that puppets—as learning tools—must move.

2. Movement: Beginnings Of The Element Of Change In Puppetry

Closely aligned to its three-dimensional quality is the element of movement in puppets through which many of its other qualities - including those of the user - emerge. All puppets must move, as must the user when he uses a puppet. MOVEMENT is what separates the stuffed animal from the moving form we call a 'puppet'.

Movement is the first key to a puppet's magical quality. Draw two eyes on a paper leaf-shape and tape the shape to a stick. As you make the leaf say—"Hello, my name is Larry Leaf. Today, I am the color gold"—make the puppet move in time to your words. Make your leaf "dance" in the wind; "float" upon the breeze; "arch and tumble" in the swirling autumn wind. Through movement in puppets, objects of the world, animate as well as inanimate, come to life. In the process, inevitably so must the user. True to form, a "cloud" puppet can appear and disappear, or talk in wispy whispers or thundering claps. The element of movement in a puppet merges naturally with human expressiveness in language and renders all matter potentially lifelike, manipulable, poetic, kinetic and eye-catching.

Because puppets are animated, they can maintain and direct the attention of those who watch them. A teacher using a rabbit face stick puppet like a pointer to guide children's eyes during chalkboard or bulletin board exercises is capitalizing on the quality of movement in puppetry. She tells the children to

follow the rabbit's enormous gray ears. Using the puppet in this way also enhances the teacher's ability to build pace and rhythm into her delivery. Have you exercised to music, and then without it? If so, you know that exercise requires flow and pace to make it satisfying. Throughout academic exercises, a puppet can serve as the vehicle for quick-starts, humorous interludes, spirited movements and memorable endings.

As attention-getters, puppets can be used to introduce lessons, special presentations or regular activities. One nature center program coordinator, for example, used leaf puppets to introduce a Saturday morning session on plant life. Each child in the group chose a tree he liked and then made a paper Leaf Puppet for the tree. The children made the Leaf Puppets talk through simple rhymes about their trees' bark, growth and seasonal cycles. Through puppets, the textbook trees came to life off the page and became an expression of the children's natural love for living things. The teacher's commitment to environmental awareness found its best expression through the puppets, which engaged his students physically (as they held their puppets) and emotionally.

Here are one third-grader's words for a Leaf Puppet, as she made it sing and dance:

I am a leafy leaf. I live on a tree.
I am very leafy, leafy, leafy.
Leafy I am. My name is Lucy.
I like to live in a juicy Apple tree.
I get full and then I drop and rot.
My head begins to nod, and I turn brown and
yellow.
I nod my head again and say the end.

3. Puppets Are Colorful

As the child's Leaf song suggests, puppetry embodies and highlights color. This quality makes puppetry especially suited to teaching and communications. Consider, for example, the degree to which puppets use and express COLOR, quite literally, in the paper, crayons and other accessories used in their construction and appearance.

Today, color is everywhere in our culture; on the walls of our rooms, on computers, in books and magazines; in movies and television. Given our immersion in color, there is a growing awareness of color and how it affects our habits of consumption and our ability to communicate.

Color takes on added significance as it is used to create life in a puppet. Yellow is the color of the fire-fly puppet's belly; red is the color of the frog puppet's long, floppy tongue. Purple may not be the color of the "Blue Monster," but he may have eaten something that didn't agree with him—a lesson that we're all subject to change of color partly because of our diet.

The act of selecting colors as you make puppets or watch them in action makes color something special,

something you've had a hand in shaping as the puppet comes to life. For children, in particular, color has a major emotional and educational influence. Puppets are a tangible means to convey this special influence, which can spark growth and inquiry in related areas.

For example, other facets of color emerge figuratively in language and voice. Through puppets, both student and teacher can explore words that have color and shadings seen and felt in the way they are expressed: loud, soft, fast, slow. Using puppets, for example, as part of oral expressiveness exercises can help students learn to treat words as the living and colorful miracle they become when they are read with feeling, rather than a drone. In the realm of oral expression, puppets are natural self-explorers. Color blends into every aspect of our lives. The more we learn through color, the greater, more whole our educational taste and vision. The use of color not only heightens the level of involvement in the learning process; it also increases sharpness of vision and perception in the learner.

Whether it is a crayon or a puppet, color-in-the-hand has educational value. If puppets can help to develop a tangible relationship to color, then the TV may at least have a viable competitor in the puppet.

The talented child who sits day after day mesmerized by the color of television with no means to participate personally in the world may forever perceive in black and white. The depth, movement and color contained in the poetry of "Leafy Leaf" may be a glimpse of tomorrow's scientific vision.

4. Bases & Shapes: Puppet Building Blocks

Just like color, form contributes to a puppet's appearance. While puppet form can emerge from a vast array of materials such as fabric, wood, paper-mache, etc., Puppetools prefers a simple view of form as "SHAPE." The element of form or "shape," as defined here, is an essential piece in the puzzle of understanding how puppets work. Seeing puppets literally spring from shapes stimulates the imagination and cultivates creative thinking.

The "Base" is that part of a puppet to which a shape (tail, eye, nose, etc.) is attached. Sometimes a puppet base also can become the essential shape of the puppet. Take the "Paint Brush" or the "Snail" puppets, for example, whose appearances are determined primarily by their shape. Both paper talker hinge puppets, the Paint Brush has a "mouth" at the tip of his bristles, while the snail has a paper body which has been curled to form the basic shape of his shell. In each case, the concept of shape, interacting with a basic knowledge of construction, has led to an exciting new puppet model.

This process has not taken hours of shopping, sewing, molding. It is a process based more on the world "as we sense it." Why spend hours trying to mold a snail shell when its approximation in a curled piece of paper captures the essence of Ms. or Mr. Snail in the way it looks and in the fascinating way it moves? The imagination is at work here not only in creating the puppet, but also in demonstrating that what we imagine is often more effective than our attempts to imitate realism or a

photographic perfection. To conjure the shape of a snail in a rolled-up piece of paper—and quickly construct such a character so that you can hold it in your hand—is about as close to magic as you can get, particularly when the puppet says hello to the child who sits wide-eyed in response to his greeting.

Working with shapes to make puppets has another simplifying benefit: for many people who generally "don't like to draw," folding a piece of paper or cutting out a shape of a "wing," for example, is preferable to actually drawing the same wing. "Drawing" implies exactness and limitation, while the cutting and folding of paper allows the imagination to flow more freely. Perhaps the involved action of the hands is more natural than the cerebral fine-tuning required to draw or illustrate on the page. For this reason, using shapes to guide you in the construction process can help free impulses in you to work simply and imaginatively.

In suggesting that you "mold the world as you see it," I am advising teachers to take pride in a creative product that resembles children's art. There is little benefit, particularly on the elementary level, in wrestling with creativity in the arena of "high expectations." If a product is too beautiful, too stylized, a child who perceives it may raise questions about his own abilities. Your work should reflect a simple charm, a do-ability that engenders a child's overt response: "Hey, that's neat!," not a covert "Gee, that's hard."

5. Shapes As Symbols In Puppets

In terms of learning and exploration, the puppet's symbolic element makes it a powerful instrument. Not because puppets themselves are powerful. But because, through puppets, the world can be presented conceptually in visual SYMBOLS.

Visual symbols are found at the heart of perception. The more visually inclined we are to define the world, the more involved we become in its creation. Columbus' perception that the world was round was at once symbolic and based on a courageous vision, which had become an alternative to the old way of seeing the world. He had learned to see other possibilities, and he acted on them.

This is not to suggest that by using puppets we will necessarily create more Columbuses (although who knows?). By using puppets, though, teachers can promote a quality of thinking in students that calls on their ability to create and bring the world to life.

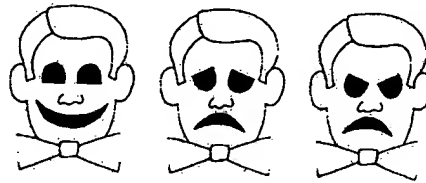
- A puppet of the sun introduces a science unit, saying "Hi, I'm the sun. Who remembers how I make plants grow?"
- A rock awakens in the hand of a museum volunteer, and yawns to introduce a tour on geology and earth ages.
- An angry puppet face is a symbol for angry feelings.
- A pyramid puppet is made to symbolize a historic event; the same puppet is used as a symbol to visually reinforce material which children read, or the instructor presents.

All puppets do not become symbols by virtue of their shapes, but a puppet's shape very often can lead the user

toward a potential use or conceptual purpose.

As visual symbols, puppets enhance communication because children readily remember what they have processed, associating what they hear the puppet say with what they see in the animated visual symbol. In this process, the visual element combines with the conceptual element to form a potent blend of visual education.

Children to express their feelings. A puppet whose



Also as symbols, puppets can be made to represent many aspects of a child's personal experience. A cardboard puppet head like Mr. or Ms. Feeling Face whose moveable eyes and mouth can be turned upside down to change expression (happy, sad, angry, evil), can be used to encourage children to express their feelings. A puppet whose big ears symbolize good listening encourages children to perk up when the puppet appears in the teacher's hand.

Organizations can reach people personally through puppet representations of their logos. A school, whose symbol is an apple, can send a pattern of the puppet home to parents, who may construct the puppet at home with the child. The puppet can then be used as a communication vehicle between school and home, and in time can become an established link for unifying activities, events, and values.

6. EXAGGERATION

Tying into all elements thus far—three-dimension, movement, color, form and symbol—the element of exaggeration introduces "seasoning," playfulness, and spontaneity to these and other qualities we will explore.

Exaggerated Color: **A BRIGHT GREEN** frog literally leaps from the pages of your book;

Exaggerated Movement: a breathless butterfly moves its wings **QUICKLY**.

Exaggerated Sound: a little mouse **WHISPERS** because it is afraid of loud noises;

Exaggerated Form: the **B I G E A R S** worn by Phil Phonics symbolize good listening skills.

Exaggeration is the foot-loose and fanciful quality in puppets, loved by young and old alike, that makes them fun, dramatic, memorable and magical. Children are mesmerized by the giant ears on your rabbit puppet. Teenagers enjoy strange voices, erratic movements and odd-shaped puppets with lots of detail. Exaggeration invites a boldness to emerge that ignores the presence of the "Censor." Adults are quick to pick up on this quality in making and using puppets because it is an avenue, in a manner of speaking, that lets them "out of school."

The element of exaggeration will also be found in forming a puppet's self-portrait or character. A "Personality Sketch" is used as a structure to help

define the role and personality of a puppet character. A personality sketch includes a puppet's point of view, taste in clothing, humor, interests, personal history and pet phrases. The element of exaggeration affects other special qualities examined separately in the Communication session which relate specifically to bringing a puppet to life: Voice, Character, Movement and Appearance. Knowledge of exaggeration can influence all of these to enhance the communication effectiveness of the puppets you use.

7. Puppets Are Creatures Of Dimension

Inside

Beyond the obvious three-dimensions of a puppet, there is a gray area, a twilight zone in a puppet into which both user and watcher are transported and transfixed. There is a point at which every non-believer in a puppet's realness returns the puppet's "hello." It is at this point that a puppet's DIMENSION becomes a channel, a means for traveling through the puppet into oneself and others; when voices, movements, and verbalizations emerge from places hitherto unknown to yourself. Puppet in hand, you are suddenly a mouse, with tiny voice, quick movements and a constant craving for bleu-cheese. "Why Bleu Cheese?" asks the child with a scrunched-up face expressing unequivocal distaste for bleu-cheese. A glance at the mouse in his blue construction paper form prompts the obvious answer from the adult, who is thankful that puppet-thoughts make beautiful common sense. A puppet's dimension allows you the luxury of a free trip to the edge of the

mind's frontier: discovery and exploration of the imagination.

Spontaneity, warmth and humor, as the above example also suggests, are by-products of puppetry's dimension. Today's communicator, by contrast, often works with a vast array of materials, most of which have been carefully prepared, produced, and packaged. Everything is perfect, programmed, systematized and sequenced. The voice on the cassette, the cards in the box, the directions for use, the next "standard of learning" you are expected to teach. Where in the land of Teflon curriculum aids and state-mandated text is there room for you—the individual—to feel personal teaching strengths (and weaknesses)? What kinds of materials can you use that actually enhance personal and professional growth in communication? What materials draw you out, feed your spirit? The packaged programs and approaches promote the tendency to become impersonal and void of character.

Outside

A puppet's dimension also allows for the exploration of "outer spaces." Through a puppet, the user moves into new realms created by the merging of knowledge and imagination. A puppet-explorer has discovered a new land. In the child's hand, the puppet describes the people who live there, the food they eat, the land and the climate. Even the "adult" imagination is charged as the child extends himself—body, mind, feeling and spirit—through the puppet. This act of learning is shared between all those who are involved; it is active and exciting as reflected in the silence of an

attentive group much more inclined to listen to the flow of a student's story; and it is fun.

Dimension in the puppet sets free the imagination and magically motivates children and adults who are attracted to puppets and credit them with real and believable personalities. Children confide in puppets and will very often do something to please a puppet that they would not do for another child or adult. Dimension is this bond of trust. Dimension is at the heart of this motivational power.

Dimension is what makes a small hand puppet larger than life in the eyes of the beholder. Dimension removes the user by illusion from the typical communications process and pathway, regardless of whether puppet and user are visible together. Especially for the teacher or parent always held in check by the yoke of authority, the dimension of puppetry places you less in control and more in the realm of the child who requires the freedom of play, equality and a sense of relating that does not impose on or overshadow his realm.

Removing authority and introducing play frees the relationship, gets the imagination moving and enhances levels of trust and motivation in the learning environment. Use of the puppet can quickly break down resistances or encourage responsibility that might otherwise take weeks. Time is saved; the learning climate warmed.

In a Language Arts lesson on vocabulary development, I once observed a class of third grade Spanish-speaking children who were reluctant to read aloud sentences they had written in

English. Few hands went up in response to the teacher's request for readers. Understandably, the children were shy and afraid that they would mispronounce their newly-learned English words. Then the teacher took her paper frog puppet in hand. Suddenly, he was whispering in her ear and she was whispering in his. In doing this, the teacher disengaged from the stalemate.

"Victor is volunteering to be tickled by anyone who reads one sentence," announced the teacher. Hands filled the air. As you might imagine, more than just one sentence was read aloud. Both children and teacher had fun doing it, as Victor made his way around the room with laughs, quips and comments that paced the exercise and held everyone's attention.

Dimension in puppetry is not determined by puppet size or puppet setting. The simplest finger puppet, the most dilapidated paper puppet used right on the end of the hand, can be as powerful as the \$300.00 hand-sewn creation which appears from behind an elaborate stage-setting.

And Somewhere 'In -Between'

Since puppets work in almost any setting, we are justified in attributing to them a dimension that encompasses the tangible and intangible. It is that "something" waiting to be given "life" by the people who come in contact with it. It is personal, interpersonal, physical, metaphysical, motor, social, a product of the mind. Advances in thinking, the stuff of breakthroughs, as we sometimes refer to them, are composed of this imaginative quality of thought. More of our learning, teaching and

communicating needs this special element that puppets can foster easily and spontaneously.

Using puppets to explore both inner (personal) spaces and outer (world) spaces can lead the user to extend self-knowledge and self-expression. It can also help to merge, unify and simplify the conceptual world in which we work as teachers and communicators. It can lead children to see the world as an integrated "whole," rather than a series of fragmented subjects. Respectively, these are the PERSONAL element and the INTEGRATING element of puppetry.

8. Puppets Are Personal

Let's look first at the PERSONAL element. Puppets are animated by the person who makes them, and brings them to life. If a degree of personal and emotional involvement is critical to effective communication, the puppet can only enhance involvement.

Puppets captivate people because, unlike many other forms of media, the puppet-user does not remove him- or herself from the communication medium. Still in control, the user permits a focus—a concentration of experience—to emerge and unfold through interpersonal dynamics. As in the case of Victor described above, this concentration of experience is, for child and adult, challenging and entertaining. Not only enthralled by puppets at work, a group of children looks to the puppet-user for continued stimulation, direction and control—play energy in puppets that enhance the communications experience for the user.

Puppets do this by virtue of the fact that they can be tied to the user's and the receiver's own personal tastes, and the puppet-maker's own sense of creation. Whether you are on the giving or receiving end, puppets can be tailored to individual tastes and needs. For example, if you enjoy hiking, cooking, telling jokes, hobbies, reading, music, etc., then use puppetry as a vehicle through which your own - or that of another's - personal tastes and interests can become part of your work. This adds a personal dimension to your work; work that can be made more satisfying because it has room for personal expression.

If you have a flair for cooking, create an alter ego puppet who is a chef and loves to set examples of organization, attention to detail, quality and execution in his culinary misadventures.

If you enjoy the outdoors, create a puppet who breathes your love of fresh air, who cares about the environment, is conscious of safety and pays special attention to the variety of natural life forms all around him.

In this vein, a puppet is like a true friend who emerges through your personal interests and shares your values. The puppet can say things openly, directly, dramatically that you might by yourself not say. Here's one example of what I mean. Fed up with undue noise and activity in her class, a second-grade teacher seizes a familiar classroom puppet, a red Mop-Hound, and explodes in a series of angry barks and growls. Surprising not only the class but also herself, the teacher has chosen a natural, spontaneous, stress-relieving

way to get the point across to the children that she is angry and frustrated.

"Gee, I guess Sandy got upset with all the noise. Let's help him settle down." They get the point. It has been delivered to them in a manner different from that of the usual verbal scolding. Nor does it sound like many of the other lectures she has given them repeatedly. This time she is expressing her anger on a level that the children immediately grasp and understand. "That happens to my dog, too, Miss Miller." There is empathy in the air. A change in voice suddenly occurred and her acting comes from a place which is familiar to the children she must reach. But the Mop-Hound is her advocate, whom the children readily accept as opposed to "respect."

The same puppet can tickle, tap, or kiss a child; raise a funny voice to correct or discipline a child without embarrassing him. No other medium for communication allows adults the freedom to touch and hug and kiss—and have it remain warm and appropriate. Even older children will respond to this highly motivational quality in puppets. It is one thing, for example to convey information to young people. It is another thing to reach them emotionally. Unlike advertising, puppets can engage and challenge an audience in non-threatening ways. Learning takes place in a relaxed manner and allows people to do their own thinking. No other medium allows you so much flexibility—so much opportunity—to combine personal interests with educational delivery.

9. Puppets Are Natural Integrators

If puppets connect personally within the people who use them, they also connect readily with the world at large. This INTEGRABILITY is one of puppetry's most remarkable qualities. The integrating element is what makes it so easy to use puppets in so many situations. Whether in the classroom, a hospital pediatrics ward, a museum workshop room or a therapist's office, puppets integrate space, time, subject and materials. The rehabilitation therapist who has been using puppets for both staff-development and patient therapy suddenly switches emphasis from the medium's rehabilitation role to public relations when a TV news reporter comes to cover her program.

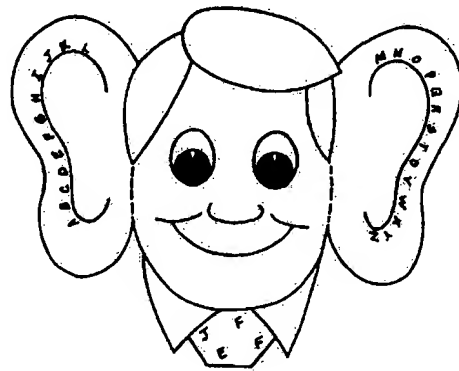
By stressing the role of the puppets in her program during the interview and the tour, she will engage the interest of the reporter in a highly graphic, visual and demonstrable way not normally available to therapists. The presence of puppets adds life and color to the segment the reporter is preparing.

This may result in more in-depth questions, more air-time for the segment, more response from the viewing community, turning mediocre coverage to dramatic and more effective public relations.

Puppets help span, integrate and unify school curriculum. In this way, a puppet is the most versatile of teaching tools, adapting naturally wherever it makes contact. Unlike some curriculum aids or packages, a puppet's use is not limited to just one subject or area of study. A bird puppet with wings that really move, for example, can serve as

the subject of a science unit, be adopted as the symbol of a local clean-up program, become a visitor from another country, be used as a mood-setter for a classroom quiet activity, be the harbinger of spring, or a safety messenger.

Puppets also integrate subject matter with value reinforcement. One second-grade teacher uses 'Phil Phonics.' "Philomena" is an option. Sporting a letter-decorated tie and exaggerated ears to catch letter sounds, Phil is used as a supplement to a reading exercise on letter identification and sound discrimination in which the teacher regularly uses books and letter cards.



She also uses Phil as an example of someone who really likes letter sounds and loves to read. Phil's big ears make him a good listener, too, and he encourages children to show him their good listening habits. Phil's name, his features and the letters on his tie, which the children can identify, are integrated symbols that draw attention to the skills that are the focus of the lesson.

Another facet of a puppet's versatility is its natural ability to work with other teaching or support materials such as books, posters, maps, games, exercises, cassettes, filmstrips, computers and arts and crafts supplies.

Through puppets, the life and effectiveness of support materials can be enhanced and extended. Your favorite poster character can become an active participant in upcoming programs. The school bus on your bulletin board, whose passengers can be seen in the windows, can really move with tape tabs and tongue depressors. Christopher Columbus can instantly replay his voyage against the backdrop of a map or slide program. In the hand of child or adult, Columbus can return after the lesson to answer questions or facilitate a transition by introducing a unit on inventors or scientists.

Storybook figures, as we have shown earlier, can literally come to life with a puppet that jumps right out of the book itself. Later the same puppet can be included in other areas of learning. For example, a popular puppet from the story read on Monday returns to introduce a writing exercise on Wednesday, telling the children some of his favorite words. The use of puppets in conjunction with these resources artfully increases their value and effectiveness.

Puppets help integrate learning processes such as oral expression, comprehension and retention of knowledge. In one sixth-grade class, students researched famous historical figures and incorporated the information they found into dramatic oral presentations using puppets. For these children the use of puppets helped bring history to life in the form of characters who gave "real life" descriptions of their time. These descriptions emerged through the imagination and knowledge of the children as they used their puppets.

10. Puppet Process

When you bring together the puppetry elements—three-dimension, movement, color, exaggeration, personal and integrative dimension—you realize that puppets are actually a way of learning unto themselves. This quality in puppets, which calls upon our special faculties of intelligence and imagination, makes puppetry an ideal **PROCESSOR** for staff development, program development and group exploration.

Above all, to be effective, learning should be playful, free-spirited, and spontaneous. If puppets offer anything, they offer these vital qualities. Puppets, however, offer more than themselves as tools with a peculiar set of characteristics. Just their presence alone in a particular setting can be enough to make a significant difference in the way people feel about their work.

A good case in point is a hospital rehabilitation program for brain-injured victims of car accidents. A program dealing with the unique problems of brain-injured patients and their families places enormous stress on its staff and volunteers who work day by day with patients who can barely respond; whose traumatized families remember loved ones—some of them teenagers—only days before an accident in the flower of their youth. It takes courage to face such people every day, while working to break through the neurologically imprisoned bodies and minds of the patients.

While the use of puppets may or may not be able to contribute to the staff's effort in the sensory stimulation of patients, they will definitely have an impact on the work and feelings of the

staff itself. In an effort to stem staff burn-out and volunteer turnover, the program director begins using puppets first for staff itself.

In a series of puppet workshops and user group meetings, her staff familiarizes itself with puppets, making them, playing with them, toying with possibilities. Puppets here are employed as a process. On the basis of this experience, especially if the work is encouraged and continued, a therapeutic milieu is created. The process through puppets serves to allow the staff to distance itself in a healthy, creative way from the harsh job realities.

The presence of puppets serves as balm on an open wound. Eventually, applications and techniques involving the patients may come about once the staff becomes familiar with the medium. But right now, puppets have served to release tension, provide a buffer and process through which the needs of staff can be addressed creatively.

Because they possess these numerable qualities so useful to teaching and learning, puppets are ultimately more than just another available alternative. Compared to all other materials used by people in a teaching and learning situation including film, music, books, chalk—virtually any media which passes through the hand for instructional purposes—puppets not only improve our work with all of these, but prove themselves time and again the superlative communication medium. Proof of this assertion rests with growing numbers of people using puppets.

"If puppets are potentially THAT good," you might be tempted to ask,

"then why don't more teachers and communicators put them to work?"

In part it is because puppets are perceived as theater. The assumption prevails that they will take too much time; that art or theater background is required to use them the right way; that puppetry cannot possibly be a priority when there is so little time for the hard business of learning.

But children are less likely to learn the basics if they are taught in such a way that goes counter to their natural sensitivity as thinking children. There is a tendency to focus on the "basics" like a myopic dog that chases one scent and one scent only: that of his master. The basics are important and can be learned, if, in the process of education, the child has learning experiences that focus beyond the basics, but which necessarily call upon their use and mastery.

If all that is focused on are "the basics," educators are not meeting their responsibilities, which include stimulating children to question, to dream and to see possibilities in themselves and the world beyond their current grasp. This means that teachers must keep in touch with themselves and find ways to nourish their love for teaching. The hand-held language inherent in puppet media is one such creative way.

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Exhibit C

Diverse Applications of Play as a Learning System

Principle Investigator: Jeffrey L. Peyton,

RE: Learning and Intelligent Systems/ (LIS) (Announcement NSF 97 -18)

National Science Foundation

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Abstract: *As a fundamental element of life inherent in all forms of matter, play is at work in natural symmetry and random events throughout the universe. Play has evolved to its highest expression in mammals as a specialized form of learning behavior. Play has been identified as a critical factor in socialization and child development. In an evolutionary sense, play is the wellspring of learning. In modern terms, play may be viewed as nature's most intelligent learning system. It is also the mental soil upon which great inventors and scientists establish their work.*

Nevertheless, the value of play is often overlooked and its effects are not seriously considered. In schools, students are barricaded from play as they ascend the grades. Even though research on play behavior relating to early childhood education fills the shelves of bookstores and academic libraries, a recent search of the literature reveals no research on the subject of adult-child play relationships. To Paul D. MacLean, Senior Research Scientist Emeritus, Department of Neurophysiology, National Institutes of Mental Health, the subject of play has proved similarly elusive in the field of brain science: "In view of the prominence of play among mammals and its civilizing influence in human evolution, it is curious that it has received so little attention in neurobehavioral research. In one handbook of experimental psychology, for example, the subject of play is dealt with in less than a page, and in a three-volume handbook of neurophysiology, there is no reference to play."

While part of the project's mission purports to raise public involvement in play—its meaning, its power, and its ability to contribute significantly to the many levels of human endeavor—the primary mission will be to demonstrate the extraordinary power of play as a learning system and how, as a brain-generated superconductor, play can be mainstreamed into educational settings by application of related tools, technology, and industrial initiative. By designing an intelligence system that functions according to the evolutionary imperatives embodied in play, appropriate forms and levels of communicative play can be directed into the learning process. In so doing, we begin to grasp its special nature and open doors to a full and integrated use of brain resources, to enhanced perceptions, sensitivities and mental literacy; and to a more enlightened

education whose foundations are predicated upon the structures and physiology of the brain itself.

A scientific spotlight on play will help add a crucial foundation to knowledge now being generated by the recent convergence of concepts, models, and technologies on which the National Science Foundation "Learning Intelligence Systems" (LIS) program is based. The application of evolutionary play principles in classroom communication and related media, based on the PI's research and patented inventions, is aimed at producing a seismic social event whose impact could send waves throughout the learning and communication spectrum.

The Tools of Communicative Play

If play can be defined as an evolutionary invention, there is, interestingly, a related behavioral expression of play and communication unique to the human realm. This refers to what are commonly known as "puppets." The ancient hand puppet has long been recognized as a symbol of play and more recently as a tool for learning. In a popular vein, puppets are widely recognized for their beneficial influence on learning and social development and have been shown to exert a powerful influence on children of all ages.

The PI has spent 25 years studying the powerful effect of puppet play on communication and adult-child relationships in the classroom. The simple act of puppet play engaged in by child and adult in which a lifelike form or behaving entity is made to move and talk produces a catalytic, predictable impact on classroom group dynamics which the PI has routinely set in motion through his workshops. This work has generated an extensive base of teacher anecdotes and video documentation attesting to the changes which classrooms undergo after introducing and working with the puppet medium. Its first-time impact recorded in teachers' journals often reiterate many comments such as follows: "I can hardly believe that a paper puppet can be so magical." "The children were mesmerized." "This has been one of the most enjoyable first few weeks of school I can remember," wrote one teacher who had recently discovered the medium.

Using puppets, a teacher can personally transform common learning barriers—oppositional behavior, negative moods, defensive attitudes—into a windfall of learning benefits and surprises. Children become more responsive and motivated. Teachers find themselves suddenly having fun. Teachers who tend to keep themselves and their emotions at arm's distance in the classroom become fully involved with the puppets and the children's response to them. The element of play induced by puppets calls up in teachers and children something vital to a learning process struggling to rise above itself. What many teachers describe as "magical" in puppets may be the fruits of the brain's deeper nature in response to vocalization, movement, and visual information associated with a powerful species-typical behavior. Thus wrapped in the temporal puppet dynamic may be found the physical expression of neurological and evolutionary events foundational to human learning.

Puppet Behavior & Brain Science

Puppet play is a form of spontaneous, species-typical behavior that induce predictable individual and group responses. It is similar to specialized behaviors in other life forms with which we

share common neurological building blocks. Like laughter, spontaneous puppet behavior can be understood, quite literally, as an event that provides insight into learning behavior. Puppets are at once a scientific looking glass and a mirror complete with a handle by which to gain an objective picture of our subjective selves.

There have been recent articles and studies which provide a context for serious consideration of puppets as valid subject of brain science. "Why Children Talk to Themselves," by Laura E. Berk, (Scientific American, November, 1994), explores the phenomenon of private speech of children. Berk's "Vigotsky's Theory: The Importance of Make-Believe Play," Young Children, November 1994, targets a critical link between play and learning in communication between adults and children. By contrast, a paper entitled "Why Dogs Bark," presented at the 1993 American Association for the Advancement of Science annual meeting, suggests that the topic introduced here, "Why Children Talk to Puppets," offers a reasonable platform for research and broad interest given the need for education reform and brain science applications. The Triune Brain in Evolution (Plenum Press, 1990) by Paul D. MacLean identifies the brain's anatomical structures which determine the biological and social relationship between play and learning.

As satellites of consciousness, the doll, the animated hand puppet, or the mouse connected to a computer work in tandem to the 'main body.' These attached and related entities represent aspects of ourselves that serve to reflect to filter, to project, and to help us grasp the essence of our nature and the nature of our ideas. To the same extent that the structures within our brains have evolved in proximity to one another to invite the playful leaping back and forth of electrical energy in the synapses, artifacts such as the hand puppet and the computer are just far enough away to allow a similar jump of impulses where things go pop, leap, move back and forth and connect in a process that bootstraps and reinforces the development of memory and consciousness.

The spontaneous, interaction induced by a hand puppet is a non-closed, self-revealing act, a reflection of the brain's expansiveness; an expressive artifact of the brain's recognition system that operates selectively (as opposed to instructively) and is ever unfolding and moving beyond itself. While it is true that children play with all kinds of artifacts that are often made to talk, the focus is on the development of a suitable medium that can be developed and systematically applied in school settings and throughout the learning-communication infrastructure.

'Hold That Thought!'

To make the use of puppets a practical option for teachers, the PI reinvented the concept of 'puppet,' turning the old model of cloth forms, scripts, and stages into an open-ended language of symbols and ideas. His patented system demonstrates that the common cultural conveyor we know as paper can be transformed into a visual, play-driven communications platform.

In this view, the hand puppet is a part of speech in a limitless learning language based on the need to communicate through play. The behavioral dynamics of puppet behavior are extracted, re-formatted, and mainstreamed via a 'Windows-like operating system that makes any idea visual to the eye and accessible to the hand in preschool to college foreign language classrooms. Simple paper puppets become hand held ideas, a powerful, low-cost communication resource

The PI's merging of the puppet medium into the common classroom staple attests to its potential as soft technology to achieve a full integration of play energy into the learning infrastructure and emerging technologies. The successful application of play and paper opens the door to extended applications in common cultural carriers such as books and computers which also use paper. The PI's on-line teacher education program, which is offered by The New School for Social Research in New York City, demonstrates that teachers can be trained in the use of communicative play via computers; that human dynamic solutions can be delivered by new technology.

The impact of a 'Windows'-like Operating System

A visual-linguistic operating system based on principles of communicative play can be employed to achieve the following objectives:

- lift classroom experience into a visual and emotive communication to infuse greater meaning and interactivity
- innovate existing and prospective learning systems and promote diversity of thought
- destabilize the repetitious, enculturated communication patterns that inhibit change
- carry a healing, bonding, and sensitizing nutrient that civilizes and warms learning environments
- prepare students to use visual and global thinking which computer-age challenges will require of them
- reverse the common misperception of 'learning disabilities' to a more inclusive view that LD traits often indicate capacities for visual and global thinking. Given the trend toward mainstreaming, it is imperative that a diverse population of learners be reached.
- equip educators with basic working knowledge of the brain using an approach that incorporates the use of play to create formative learning experiences.

Important Lessons in Brain Science for Educators

1. The brain is a selection instrument. It seeks new information on the basis of recognition—not instruction—and play.
2. Play process provides ingredients that foster a healthy quality of mind: openness, spontaneity, and unpredictability—all-important operating characteristics of the healthy brain.
3. The brain's primary mode of communication is nonverbal and visual.
4. Play is an evolutionary invention linked to speech, nurturing, and learning in mammals. Play can be harnessed to drive the learning process and to lead us into a greater understanding of our intelligence.
5. A major factor in human capacity for speech, language and cultural evolution is the hand. The visual, expressive, gesturing hand is ancestor of communication, ideation, and written speech. Education must find ways to involve this important taproot that goes to

the heart of learning. The hand puppet is but one of many tools capable of performing extraordinary missions in the classroom.

Prospective Project Components

- Use of brain imaging technology to confirm the full integration of brain resources called up by the use of puppets
- Lead and coordinate the development of on-site research models to measure the impact of communicative play tools and techniques and the implementation such research
- Lead and coordinate the development of mass communication models using common cultural staples such as paper, books, and computers and communicative play tools, and the conduct of research models to measure the impact of their use
- Identify prospective partners in schools, academic institutions, and industries toward implementation of the above.

Exhibit D

Symbol minded

Relationships with others have helped to shape our ability to learn language.

The First Idea: How Symbols, Language, and Intelligence Evolved From Our Primate Ancestors to Modern Humans

by Stanley I. Greenspan & Stuart G. Shanker

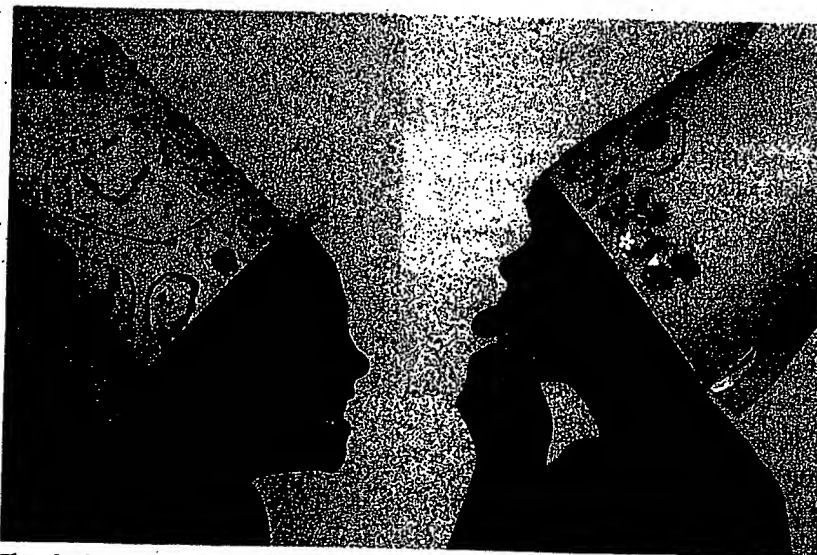
Da Capo: 2004. 512 pp. \$25, £18.99

Peter Hobson

What are the bases for human symbolic thinking and language? This is a question that prompts fierce confrontation between those who defend what is distinctively interpersonal about human social engagement, and those who aspire to computational reductionism in modelling cognitive development. *The First Idea* joins the attack on the side of the interpersonal camp (rather like a Sherman tank, in fact), to shake if not destroy the forces of nativism and individualism.

The impetus behind the intellectual assault comes from a conviction that the origins of symbolizing, both in human prehistory and in the early development of young children, lie in emotionally patterned interpersonal relations. It will not do to pivot an account of the origins of thought and language around cognitive constraints that are hard-wired into the brain. In *The First Idea*, Stanley Greenspan and Stuart Shanker insist that we have radically underestimated the developmental role played by emotions that link humans together. They consider that "successively more complex interactive emotional signals", and the cultural practices that are founded on and exploit such communication, both structure and integrate the psychological abilities required for thinking.

It takes many pages for Greenspan and Shanker to lay out their theory as they range over the domains of child development, primate social and communicative abilities, autism, the origins of culture, and even the future evolution of humanity. Modesty is not an obstacle to their forthrightness: again and again we are told how, largely through their own observations, the authors have enjoyed flashes of insight denied to others. Yet for all their expansiveness, the authors are justified in thinking that they challenge some widely held presumptions about the nature and development of thinking. Notwithstanding the contributions of Lev Vygotsky and his followers, who have stressed the social origins of higher forms of cognition, it is still radical to situate communication between people not at the periphery of human thinking and language, but at its core. The clinical experience of Greenspan



Play school interactions between children help them to improve their symbolic thinking.

(a child psychiatrist and psychoanalyst) and the thoughtfulness of Shanker (a philosopher and psychologist) allow them to elaborate a distinctive view of human development and psychopathology.

It is this viewpoint that sets this book apart. Although I found myself resisting the sweep of the authors' 16 developmental stages of emotional and intellectual growth, the book's cumulative effect is to give the reader a deeper appreciation of the power and formative potential of human emotional interaction. It contains enough provocative ideas about the kinds of social and developmental processes at work in various aspects of intellectual and cultural life to set the framework for new theoretical and empirical investigations.

Regarding human evolution, for example, it is highly plausible that it was the increased ability to communicate and coordinate subjective states with others, together with concurrent changes in cultural practices, that led to a revolution in cognitive functioning through the acquisition of symbolic thinking. In the field of developmental psychopathology, the authors have good reasons to view the primary deficit in autism as the child's difficulty in engaging with others on an emotional level. There is something theoretically, as well as therapeutically, compelling in observations that these children's cognitive functioning may improve substantially when it proves possible to enhance their relationships with other people. Just as *The First Idea* expounds how patterns of mutual emotional and communicative exchange with others are vital

for typical development, so too its authors point out that where there is no mutuality, the repercussions are profound.

The devil is in the detail. Often the authors make statements with little more support than their personal observations. For example, they state that the human capacity for engaging in longer and more continuous chains of emotional signals is what allows us "to negotiate and solve problems, and, thereby, more fully separate perceptions or images from their fixed actions and construct higher and higher levels of internal symbols". They tell us how "emotional recognition that one's actions can have an impact on someone else is the foundation for sequencing, that is, the ability to carry out many steps in a row where each one is related to the previous one". These are interesting possibilities, but is there evidence to convince us one way or the other? The authors often cite studies in child development, anthropology or neuroscience that seem to be congruent with their position. But do not expect to find detailed or critical analyses of scientific evidence. In flourishing a broad brush, the authors seem intent to impress the general reader rather than engage the mind of the scientific sceptic.

Apart from matters of evidence, does this book really explain how interpersonal engagement yields symbolic thinking? Here the authors chide Piaget for failing to come up with the goods but, other than correcting the one-sidedness of his theory, do they really do better? Take their account of how symbolizing is achieved by separating perception from action. Piaget identified

books and arts

the critical property of symbolizing as the emancipation of thought from action, and of meanings from the objects to which those meanings usually apply. What seems to be missing from *The First Idea* is an account of the mechanisms by which social influences allow children to ascribe alternative perspectives, recognized as such, to and through symbols. There are candidate explanations — my own view is that the emotionally grounded process of identification between a young child and others does the trick — but the authors seem to feel that their arguments suffice.

Through their creative thinking about emotional and interpersonal aspects of early human development, Greenspan and Shanker have helped us to find our bearings for the intellectual fight ahead. I just wish their map had been adjusted in scale, to something nearer pocket size.

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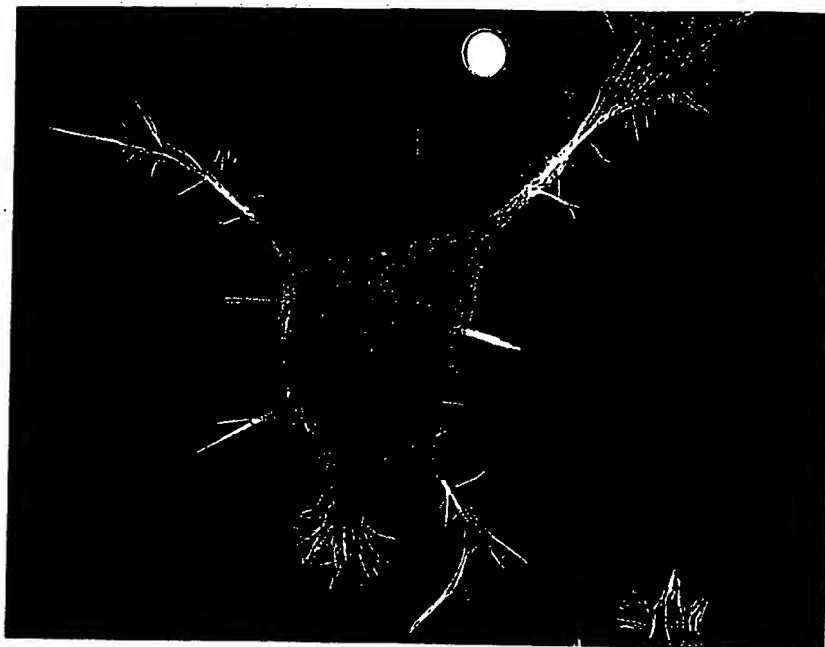
Sizing up a growing field

Cell Growth: Control of Cell Size
edited by Michael N. Hall, Martin Raff & George Thomas
Cold Spring Harbor Laboratory Press: 2004.
652 pp. \$135, £95

**Brendan D. Manning and
Lewis C. Cantley**

The terms 'cell growth' and 'cell proliferation' are often used synonymously to mean an increase in cell number. Strictly, though, cell growth refers to an increase in cell size or mass, whereas cell proliferation is an increase in cell number due to cell division. The two processes together determine the ultimate size of cells, tissues, organs, even organisms. Cell proliferation is almost always accompanied by cell growth, except, for example, in the early stages of embryogenesis. But cell growth often occurs without cell division, for instance in terminally differentiated cells such as myocytes and neurons.

Cell growth underpins many critical cellular and developmental processes, yet studies on its regulation and mechanisms have lagged behind those on cell proliferation and cell-cycle progression. However, a flurry of genetic, cell biological and biochemical studies over the past ten years have made great strides towards discovering the signalling pathways and mechanisms that drive cell growth. *Cell Growth*, edited by three investigators at the forefront of this research, Michael Hall, Martin Raff and



Growth factor: neurons can increase their size dramatically by extending axons and dendrites.

George Thomas, details our current knowledge of this field.

The all-star cast of authors assembled for this work gives a clue to the book's likely impact. In the foreword, Paul Nurse sets the stage by defining perhaps the most perplexing question in the field: how does a proliferating cell double its mass and contents once per cell division, with near-perfect precision? Central to this question is whether or not a cell has the capacity to monitor its own size, and several chapters revisit this problem. Nurse's discussion of the growth patterns used to achieve a constant cell size is complemented by Patrick O'Farrell's opening chapter on the evolution of body size in metazoans. O'Farrell brilliantly delineates the constraints that all higher organisms face in

reaching their final size, and the enormous variety of developmental patterns used to overcome these constraints.

Pioneering studies on cell growth control by Nurse and Lee Hartwell in yeast, and by Anders Zetterberg and others in mammalian cells, have focused on the nature of the relationship between cell size and cell-cycle progression. Many proteins and pathways involved in cross-talk between these two processes have since been characterized in yeast, flies and mammals, and these are detailed in the early chapters. The main theme that emerges is the wide range of distinct mechanisms to coordinate growth and division that exist between different systems, even in different developmental stages of the same organism. The wiring of networks

New and revised textbooks

Human Evolutionary Genetics: Origins, Peoples and Disease
by Mark A. Joblin, Matthew Hurles & Chris Tyler-Smith
Garland Science, 523 pp. \$61.95, £35

Understanding DNA: The Molecule and How It Works (3rd edn)
by Chris Calladine, Horace Drew, Ben Luisi & Andrew Travers
Elsevier, 334 pp. £29.95, \$45

Animal Physiology
by Richard W. Hill, Gordon A. Wyse & Margaret Anderson
Sinauer, 776 pp. \$104.95, £37.99

Gastrulation: From Cells to Embryos
edited by Claudio D. Stern
Cold Spring Harbor Laboratory Press, 731 pp. \$150, £100

Introduction to Protein Science: Architecture, Function, and Genomics
by Arthur M. Lesk
Oxford University Press, 310 pp. £26.99, \$51.95

Molecular Markers, Natural History and Evolution (2nd edn)
by John C. Avise
Sinauer, 655 pp. \$59.95, £38.99

Immunobiology: The Immune System in Health and Disease (6th edn)
by Charles Janeway, Paul Travers, Mark Walport & Mark Shlomchik
Garland Science, 848 pp. \$74.95; Churchill Livingstone, £39.99

Human Evolution: An Illustrated Introduction (5th edn)
by Roger Lewin
Blackwell, 277 pp. \$44.95, £19.99

in far more economic gains than losses, and fewer fatalities, than during other years because of the reduced number and intensity of landfalling Atlantic hurricanes and the record winter warmth in the Midwest.

Perhaps the book's most important message is that: "The solutions to serious environmental problems will elude us unless we are all aware of, and respect, the profound differences between the world of science and human affairs." This harks back to

C. P. Snow's lectures on the 'two cultures' but with a twist; whereas Snow viewed science and technology as a panacea for solving the world's great social problems, Philander recognizes that science and technology are only part of the solution. Effective use of scientific information to benefit society must also reckon with prevailing cultural values and political imperatives.

Our Affair with El Niño is a very readable, entertaining and instructive book that will

appeal to scientists and non-scientists alike. The author does not shy away from controversy in expressing his opinions about the sociological and political aspects of climate research. Whether or not you share his opinions, Philander unquestionably excels at describing the physics of the ocean, the atmosphere and El Niño in lucid terms. ■

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A helping hand

Hearing Gesture: How our Hands Help us Think

by Susan Goldin-Meadow

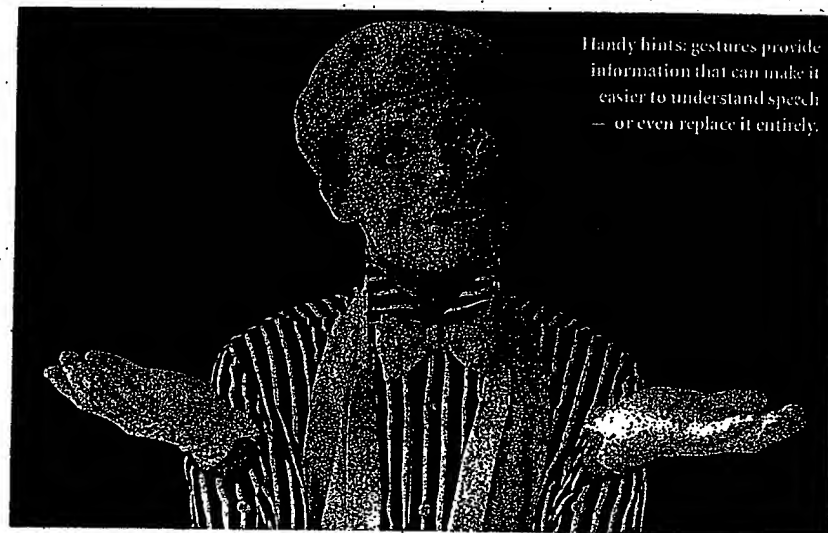
Belknap Press: 2003. 304 pp. \$29.95, £19.95, €27.70

Eve Sweetser

Over the past two decades, researchers have produced overwhelming evidence that the gestures we use as we speak are integrally connected to both our speech and our thought processes. Susan Goldin-Meadow has been at the forefront of this new scientific direction. In *Hearing Gesture*, she provides a synthesis of her decades of work on gesture studies. It is a welcome scholarly arrival for gesture researchers, and should be important news to social and cognitive scientists, who so far have paid little attention to the gestures that accompany speech.

Hearing Gesture is an engaging, (even suspenseful) read and, with its clear and informal style, should be largely accessible to non-experts. It centres around four primary questions. First, is gesture really a window on thought? If it is, do most people (as opposed to just researchers) read gesture? Does gesture also help the speaker's own cognitive processes — and if so, how? And finally, what are the differences between the gestures that accompany speech and visual gestures used on their own? Goldin-Meadow examines these questions — her answer to the first three is 'yes', by the way — in the lab and in everyday settings such as the classroom. In so doing, she looks at the communication of infants, children and adults, including sighted and blind, deaf and hearing, and normal and cognitively impaired subjects.

Goldin-Meadow has pioneered ways of studying gesture, one of her signature methods being the comparison of 'matched' gestures, which overlap in meaning with the accompanying speech, and 'mismatched' gestures, which either complement or conflict with the linguistic meaning. With Breckie Church she observed children explaining their answers to piagetian conservation tasks (conservation of mass, number or volume when physical appearance is altered). Some children produce mismatched gesture-



Handy hints: gestures provide information that can make it easier to understand speech — or even replace it entirely.

speech pairings. For example, they say that a tall, thin container has a large volume "because it's taller", but simultaneously make a gesture indicating width; this shows awareness that the container's width, as well as its height, is relevant to the quantity of water it holds. These children, it turns out, are the ones who are most ready to learn about conservation, either by instruction or experimentation (*Cognition* 23, 43–71; 1987).

The contrast between matches and mismatches turns out to be a remarkable tool. Goldin-Meadow's later studies show that matched gestures lower the cognitive load on the speaker and speed the listener's comprehension, whereas mismatched gestures raise the load on both sides of communication, which makes sense because they bring in another cognitive model besides that presented in speech. However, Goldin-Meadow argues that mismatches are advantageous in other ways. Because hearers do 'read' gestures and process the information expressed (as also shown in earlier work by David McNeill and Adam Kendon), mismatched gestures not only allow speakers to express models that are inaccessible to speech but also give listeners access to those models, with the added advantage of providing potential feedback to speakers.

The use of the term 'mismatch' presents difficulties from time to time — it is regretably not always clear which kind (comple-

mentary or conflicting) is most relevant in a given study. The author remarks that gestures rarely correspond precisely with words in meaning. Taken to its logical conclusion, this should mean that complementary mismatches, like matches but not like conflicting mismatches, show overlap between gestural and linguistic meaning — the boundary between matches and mismatches is perhaps presented as more tidy than it really is. However, there is careful differentiation in some crucial cases, such as the examination of cognitive load, and Goldin-Meadow comments that apparently conflicting mismatches often reflect different aspects of a potentially unified larger cognitive framework.

Another strand of Goldin-Meadow's work has been the examination of purely gestural communication, including that of deaf children with hearing parents. She compares their individual gestural systems with conventional signed languages and with hearing gesture that has taken over the communicative load. This provides rich evidence from several domains for McNeill's claims that gesture becomes 'language-like' when it takes on the primary informational load of communication. Gesture becomes conventionalized, segmented and even 'grammaticized' — the gestural systems of orally raised deaf children have a basic grammatical structure.

I have touched on only a few of Goldin-

Meadow's projects and methodologies. Readers will be impressed by her extraordinary combination of thoughtful insight, experimental ingenuity and immense persistence and dedication to the search for knowledge. She and her co-workers are currently researching such applied issues as the need to interpret children's gestures alongside speech in legal and psychiatric questioning, and also the degree to which adult questioners' gestures influence children's output.

Fully recognizing the vast unknown areas awaiting gesture researchers' attention, Goldin-Meadow presents multiple viewpoints where there is disagreement, in the examination of signed language-gesture, for example, or the connection between gesture and lexical access. And she continues to push the boundaries of her field, raising new questions alongside the ones she answers.

Hearing Gesture stands beside McNeill's *Hand and Mind* (University of Chicago Press, 1992) and *Language and Gesture* (Cambridge University Press, 2000) as a milestone in the study of gesture's relationship with language and thought. It may help to reshape the basic premises and methods of psychologists, linguists and other social scientists. ■
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Bedside stories

The Body in the Library: A Literary History of Modern Medicine

edited by Iain Bamforth

Verso: 2003. 418 pp. £16, \$25

John Carmody

Ever since C. P. Snow's *ex cathedra* declaration of the constraining existence of two cultures — the unbridgeable separation of the sciences and the humanities — scientists have been forced on to the defensive. It rarely seems to matter greatly that 'liberal' and 'literate' people know little of science. And it rarely seems to be appreciated how creative and profound science can be — or how torpid and turgid many humanities texts are.

Medicine should bestride both of Snow's cultures, binding them with imagination and the truest humanity. At its best it can do this: in the divine hierarchy of classical Greece, Apollo was a god of both medicine and music. Iain Bamforth is a medical doctor as well as an essayist and poet, and his new anthology, *The Body in the Library* — despite a title that suggests crime and malfeasance — is a superb reminder that the creativity of physicians flows beautifully beyond the consulting room or laboratory. Not all of the authors in his "history of medicine as told through literature" are doctors or medical scientists,

Exhibition

Living with luminescence

Frazzled by the frenetic lifestyle of the future? No problem, a luxury lounge bathed in soft, calming bioluminescence will soothe your worries away. That's the art concept created by Sydney-based microbiologist Kathy Takayama and artist John Nicholson, who unveiled their exhibit — entitled *LuxCorp* — at the Canberra Contemporary Art Space on 14 May.

With their prototype light-emitting furniture (right), they present a vision of a future in which human-bacterial interactions are taken to a new dimension. The light emitted is a simulation of the bioluminescent by-product of bacterial communication. The exhibit is part of *Metis*, the



Australian festival of art meets science, and runs until 18 June.
Carina Dennis

but I found the pieces that were written from the inside to be telling and touching.

Bamforth has confined his selection to material that was "produced after the event which turned medicine into a public utility — the French Revolution". Although the "modern medicine" mentioned comes from the nineteenth and twentieth centuries, Bamforth does seem to share my view that modern medicine really began in 1543 with the publication of the great anatomical text *De humani corporis fabrica* by Andreas Vesalius. More important, though, is the scope of Bamforth's trawl, which has gathered together some lovely work that would normally escape the attention of anglophone readers (or any who are monolingual). If I note a lacuna, it is a lack of direct, rather than narrative, writing about medical science: surely a Nobel prize address or two would have been worthy of our attention?

After an exhilarating and provocative introduction, and a debatable beginning with Dickens, this collection plunges us into a banquet of many delights. One of the earliest (from 1812) is an urgently written letter by Fanny Burney, recounting a dreadful operation. This is matched by the wonderfully ironic *The Cure* from 1810 by Johann Peter Hebel, and we are then brought abruptly to earth by the episode of the botched Talipes (club-foot) operation in *Madame Bovary*. The worldly wise Lytton Strachey shows us Florence Nightingale in her great days in the Crimea: it is chastening to be reminded of the old (but enduring) strife between doctors and nurses. Léon Daudet reverses that mirror to show us the *mélange* of the magnificent and the malicious in the nineteenth-century neurologist Jean Martin Charcot, putting me edgily in mind of one of my own pedantic and francophile clinical professors.

Not everything here is a success, though. There is a wooden-headed piece by G. K. Chesterton, a rather pointless letter by Anton Chekhov, some self-importance (*Illness*) from Virginia Woolf and vacuity from Alain, the pseudonym of philosopher Emile-Auguste

Chartier. Set against those stumbles are a surreal story by Franz Kafka, its tone utterly unexpected from its bland title, *A Country Doctor*; a chilling medical-social narrative commentary by William Carlos Williams (*Jean Beicke*), the droll *My Double* by Alfred Döblin and the dazzlingly cynical *Oedipus in Danger* by Robert Musil.

In *Irrationalism and Modern Medicine*, Gottfried Benn coolly and prophetically asks about the point of extending an unexamined and spiritless life. This, surely, is a daily question for contemporary medicine, but when we do die — no matter how long we delay that fatal event — is it important to do it "well"? Can we achieve that, and does it matter? After reading George Orwell's *How the Poor Die* we have to wonder about the manner of our death as a reflection or an inevitability of our life. Like Dezső Kosztolányi's *The Stranger*, Orwell's dispiriting story should refocus the physician's mind on to the challenge of thinking of the patient as a brother. For all his empathic fame, R. D. Laing's *Clinical Vignettes* made little impression on me and certainly did not achieve a comparable insight, in marked contrast to the honest human bewilderment of the extracts from Miguel Torga's *Diary*.

The episode that I treasure most in this inspiring and yet unsettling anthology is *Heart Suture* by Ernst Weiss. With the deftness of an accomplished surgeon, it whips us from the set-piece detachment of classical 'grand rounds' to an emotional wrench when a young anaesthetist realizes that the God-Professor's emergency patient is his former lover. The professional and the personal are balanced with admirable finesse, with a cogent resonance for the reader of bitter experience or the relief of a "There but for the grace of God..."

I am left, then, with an aphorism (which Bamforth quotes): "Perhaps one day we will realize there was no art but only Medicine." ■
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Exhibit E

This Position Paper was published and disseminated at the Emotions, Learning, and Education Symposium held in Copenhagen, Denmark, November, 2004. The meeting was sponsored by the OECD/ Center for Education and Research Innovation (CERI) and the Learning Lab, Denmark. —Jeffrey L. Peyton

My work with puppets and teachers has proceeded under a key assumption: Find a way to systematically inject play energy into the flow of communication in classrooms, and you will have harnessed important raw chemicals from the brain—needed for thinking and communication—energy by which to warm and propel the field of education. Make playful communication second nature on a systematic scale, and a strategic means to transform the learning culture is suddenly available. Playful communication has the power to surprise and destabilize the rigid character of conventional communication practiced by adults in the world's classrooms. Playful communication has the potential to exert broad impact and overnight transformation on the learning culture. This may sound like a tall order for such an amusingly innocuous tool as hand puppetry, but puppet play is a highly contagious and emotionally charged visual language. "We need languages that fit the present time—that can deal with the collective as well as the individual and that transcend traditional boundaries of tribe, nation, and culture," wrote Peter Senge. Puppet Play, practically applied, qualifies as one such language. The hand puppet is a force of nature—a symbolic bloom of organic art on the hand—at once a tool, a media, a language, and a technology capable of integrating, transmitting, and transferring information and opening the mind.

Puppets are widely known for their magical capacity to bring down psychological walls or perhaps pass through them. Somehow the little buggers always get a response. They always make it past the censors and the gatekeepers—Resistance, Fear, Control and Rigidity. In a world where classrooms are increasingly consumed with a strictly academic mission, play in the classroom stands out. The simple act of puppet play engaged in by child and adult in which a lifelike form or behaving entity is made to move and talk produces a catalytic, predictable impact on classroom group dynamics. My work, which involves teachers making their own puppets and putting them to work, has generated an extensive base of teacher anecdotes and video documentation attesting to the changes which classrooms undergo after introducing and working with the puppet medium. "I can hardly believe that a paper puppet can be so magical." "The children were mesmerized." "This has been one of the most enjoyable first few weeks of school I can remember," wrote one teacher.

When autistic children begin speaking in the presence of a puppet, the medium typically works to unlock internal, psychobiological structures and pathways. Puppets send a signal to disarm and that 'it's safe to come out'. Without puppets it is often very difficult to broach sensitive subjects, but because puppets can symbolize and articulate and project a given issue embodied in a 'third party', they make reaching children much easier and less threatening. This has implications for neutralizing the conditions of stress and fear that lead to alienation, violence, suicide, obesity, and substance abuse—and for preventing adult-induced variations of these widespread conditions related to child development and education. Play may send a strong enough message to derail the current train of testing and accountability.

Using puppets, a teacher can personally transform common learning barriers—oppositional behavior, negative moods, defensive attitudes—into a windfall of learning benefits and surprises. Children become more responsive and motivated. Perhaps most important, adults find themselves suddenly having fun. Teachers who tend to keep themselves and their emotions at arm's distance in the classroom become fully involved with the puppets and the children's response to them. The element of play induced by puppets calls up in teachers and children something vital to a learning process struggling to rise above itself. What many teachers describe as "magical" in puppets, I submit, could be the brain's deep need and response to aural, physical, kinetic, visual, emotive stimulation produced by a powerful species-specific, play- and art-based behavior.

In 2002, using near-infrared Optical Topography® (Hitachi, Inc), I worked with Dr. Tom Bass of Children's Hospital of the Kings Daughters, Norfolk, Virginia, who assisted me in designing a protocol to "image the brain at play." The project showed a significant increase in cortical blood volume during puppet play as compared to the performance of similar activity in a familiar routine manner. The study has since been recognized by Pediatric Academic Societies and is pending publication by the Journal of Child Neurology. Dr. Tom Zeffiro, Director of The Center for Functional and Molecular Imaging at Georgetown University Medical Center, has agreed to collaborate with me to further define and study physiologic changes in the central nervous system associated with play.

Beyond puppets and imaging, the larger issue of play behavior in classrooms offers an incredibly rich arena for research. More research in this area would serve to legitimize play in the eyes of school policy-makers, beyond its recognized importance in early childhood education, and help to establish play as a 'natural learning resource' capable of ameliorating many systemic issues challenging education. Imaging may give us a clear snapshot, but it is more important to establish working models in classrooms and schools around the world where play's impact on communication and the overall learning can be documented.

Interest and respect for play can be fostered in both real and virtual communities. Building play into commercial products would also foster and promote play. Puppetools represents a working model of that potential, and I would like to propose that it be considered for adoption by the OECD Project on Brain Research and Learning Science in its evolving plans for web-based teacher training and participation.

The capacity for childlike thought and symbolic use of the imagination is precisely the soil that Einstein, Edison, and DaVinci tapped into and became the playground in which they conducted their work. That soil is the birthright and the internal springboard for learning—residing within each human being—but especially within each child. This capacity—and the principles of human evolution that underlie it—represents the foundation upon which our relationship with the young should be guided.

ELE: Emotions, Learning and Education

Seminar co-organised by

Learning Lab Denmark and CERI

8-9 November 2004

**Carlsberg Foundation
Copenhagen, Denmark**

Monday, November 8

12:00-12:30 Registration

12:30-13:00 Welcome/Introduction and Goal Setting
(Hans Siggaard Jensen & Søren Kjær Jensen, LLD, Tom Schuller, CERI)

13:00-14:00 Lunch

Session 1 (chaired by Bruno della Chiesa, CERI)

14:00-14:30 Emotional literacy improvements in the UK gained from the EXPRESS Project
(Alan Watkins – Cardiac Coherence Ltd)

14:30-15:00 First lessons on Emotions & Learning from the Ulm Project
(Katrin Hille – Forschungsleitung, Transferzentrum für Neurowissenschaften und Lernen)

Session 2 (chaired by Eamonn Kelly)

15:15-15:45 Stress, Education and Learning
(Ulrike Rimmele – Psychologisches Institut der Universität Zürich)

15:45-16:15 Cognitive performance & learning related to motivation, psychosocial & emotional factors
(Jellemer Jolles – Institute of Brain & Behavior, Faculty of Medicine & Faculty of Psychology, Maastricht University)

Session 3 (chaired by Christian Gerlach)

16:15-16:45 Factors of Evolution Revealed In Hand Puppet Behavior
(Jeffrey Peyton – Puppetools)

16:45-17:15 Food for thought: Linking education to emotion, motivation and learning
(Morten Kringelbach – University of Oxford)

Session 4

17:30-18:00 Presentations of themes extracted from the submitted position papers
(presented by Christian Gerlach)

19:30 Evening programme

Tuesday, November 9

08:30-09:00: Arrival and coffee

Session 5

09:00-12:00

Parallel workshop groups on the themes

1. Training emotional competencies
2. Motivation and learning with a brain perspective
3. Environment, sociality, emotions and learning
4. Emotions in education: stress and mastery

12:00-13:00

Lunch

Session 6 (chaired by Jarl Bengtsson)

13:00-15:00

Presentation and discussion of workshop ideas

15:00-15:15

Reflections on the workshop ideas
(Walo Huttmacher)

Session 7 (chaired by Hans Siggaard Jensen and Søren Kjær Jensen)

15:15-16:15

Plenum discussion of ideas and future directions of research and education practices based on emotions and learning

16:15-16:30

General conclusions:
(Jarl Bengtsson, Bruho della Chiesa & Søren Kjær Jensen)

Novel motor/somatosensory activity is associated with increased cerebral cortical blood volume measured by near-infrared optical topography

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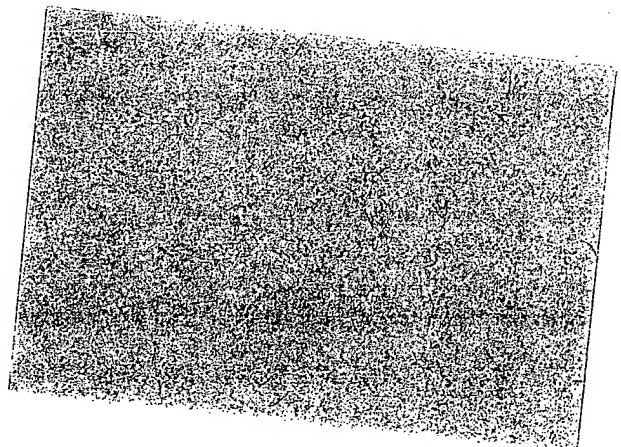
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This study was done at the Children's Hospital of The King's Daughters and Eastern Virginia Medical School, Norfolk, Virginia, and sponsored by the Divisions of Neonatal Medicine and Pediatric Neurology.

Presented at the Pediatric Academic Society Meeting, Seattle, Washington, May 2003

Presentation at the Brain and Learning Project: Emotions, Learning and Education.
Organization for Economic Cooperation and Development. Carlsberg Academy,
Copenhagen, Denmark, November 8, 2004.

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Novel motor/somatosensory activity is associated with increased cerebral cortical blood volume measured by near-infrared optical topography

ABSTRACT

Recent reports suggest learning is enhanced by emotion, spontaneity and play. The mechanisms of this enhancement are unclear and may involve increased cortical stimulation by the limbic system. Since neuronal activity is tightly coupled to changes in cerebral blood flow and volume, the demonstration of increased cortical blood volume during playful versus routine motor/somatosensory activity would imply enhanced neuronal activity and provide insight into the complex interaction between play and learning. Near-infrared spectroscopy was used to detect changes in cortical blood volume during performance of (1) rudimentary visual, motor and speech tasks, (2) integration of the tasks in a familiar routine manner and (3) integration of the tasks in a novel, spontaneous, playful manner. No significant differences in cortical blood volume were found during performance of the individual rudimentary tasks and their routine integration. However, the novel integration activity was associated with a significantly greater increase in frontal lobe oxyhemoglobin, deoxyhemoglobin and total hemoglobin as well as parietal lobe total hemoglobin. This small pilot study provides a limited measure of physiologic support for a relationship between play and learning.

Novel motor/somatosensory activity is associated with increased cerebral cortical blood volume measured by near-infrared optical topography

INTRODUCTION

To many of us, a relationship between emotion and memory seems almost intuitive.

Small details of where we were and what we were doing at times of extreme emotional stress such as the assassination of President Kennedy, the explosion of the space shuttle or the bombing of the World Trade Center, are easily recalled years later. Investigation of the complex relationship between emotion, learning and memory is now possible because of advances in our understanding of the anatomical organization and physiology of the brain, and the neural basis of cognition.¹ This exciting area of investigation not only includes behavioral research but now extends to the basic science laboratory with studies into alterations in neurotransmitters and their receptors, and changes in neuronal protein synthesis associated with emotion induced memory.² Recent reports also suggest learning is enhanced by other behaviors modulated by the limbic system, i.e. play and spontaneity.³

Play is a basic factor in the lives of humans and other species. This instinctive activity is hard-wired into our genetic code, promotes creativity, helps us adapt and is probably essential for normal human development.⁴ However, play is very difficult to define to the satisfaction of clinical investigators. SL Brown suggests that play may best be thought of in terms of its components; curiosity, discovery, risk-taking, trial and error, pretense, games, social etiquette and other more complex adaptive activities – many of the same components of learning.⁴ The difficulty in defining play, together with the lack

of a safe, non-invasive technique that can be used for extended periods of time to study secondary physiologic changes in the central nervous system, has hindered progress in this area of study.

Over two decades ago, Jobsis described an optical technique of non-invasive monitoring of cerebral oxygenation and hemodynamics.⁵ This technique is based on the finding that light in the near-infrared spectrum, that is wavelengths of 750 to 850 nanometers, is absorbed by only two biological compounds, hemoglobin and cytochrome oxidase, the latter contributing only a small fraction of the overall absorption. Therefore, the amount of near-infrared light absorbed by a biologic tissue is directly proportional to the amount of hemoglobin present in the tissue. In addition, deoxyhemoglobin has a different light absorption spectrum than oxyhemoglobin making it possible to determine their relative concentrations. Near-infrared spectroscopy has been used to evaluate cortical changes in deoxyhemoglobin and oxyhemoglobin in response to visual^{6,7,8,9}, motor^{10,11,12,13}, and auditory stimuli.^{14,15} Cognition and language induced changes in cortical hemoglobin concentration have also been documented by near-infrared spectroscopy.^{16,17}

In the present study, we used near-infrared spectroscopy to study cortical hemoglobin changes associated with play activity defined simply as the novel, spontaneous integration of rudimentary tasks. Our hypothesis was that the integration of rudimentary tasks in a playful, spontaneous manner would increase cortical hemoglobin to a greater extent than the integration of the same tasks in a familiar, routine manner. This finding would imply increased cortical neuronal activity associated with play and may provide insight into the complex relationship between play and learning.

METHODS

Subjects

The subject group consisted of six healthy, right-handed, male subjects (ages 9,15,19, 39, 50 and 58 years). After a general discussion of the monitoring technique, each subject was comfortably seated in a quiet room, asked to relax, close their eyes and limit movement. They were then fitted with the multi-channel near-infrared spectroscopy probes (Figure 1). The probes were placed sequentially over the occipital, left parietal and frontal areas during each set of tasks in each subject. The Institutional Review Board of Eastern Virginia Medical School approved the study.

Subject Testing Activities

Rudimentary tasks

While monitoring changes in cortical hemoglobin, each subject was instructed to perform three rudimentary tasks:

Visual task – After a ten-second period to record baseline cerebral blood volume, the subjects were instructed to open their eyes for 20 seconds and observe a familiar face (the face of George Washington as depicted on the U.S. one-dollar bill). They then closed their eyes during a 50 second relaxation period (Figure 2). This sequence was repeated three times.

Motor task – The subjects were instructed to perform finger tapping of the raised right hand for 20 seconds followed by a 50 second relaxation period and this sequence was repeated three times. During the period of activity other movements were limited as much as possible and the eyes remained closed.

Speech task – The subjects were instructed to speak in a familiar routine unemotional manner by reciting the alphabet for 20 seconds followed by a 50 second relaxation period and repeated three times. During the speech task the eyes were closed and other movements were limited.

Integration of rudimentary tasks

Non-novel integration task – Integration of the visual, motor and speech rudimentary tasks was attempted by instructing the subjects to open their eyes and observe their manipulation of a finger puppet made from a copy of the same familiar face used above (George Washington from the one-dollar bill) as they spoke by reciting the alphabet.

This non-novel integration task was performed for 20 seconds with a 50 second relaxation period and repeated three times.

Novel integration task – Integration of the rudimentary tasks was then attempted in a novel, playful manner where the subjects were instructed to open their eyes and observe their manipulation of a cartoon face hand puppet while speaking in a spontaneous, non-rehearsed way. Again, this novel integration task was performed for 20 seconds with a 50 second relaxation period and repeated three times.

Monitoring of Changes in Cortical Hemoglobin

During the activities described above, changes in cortical hemoglobin were measured with the Hitachi Optical Topography® NIRS system as described elsewhere.¹⁸ Briefly, Optical Topography utilizes near-infrared light in an array of multiple emitters and detectors arranged in a 24-channel matrix (Figure 1). This system provides regional

information on hemoglobin concentration changes in the cortex as well as independent measurements of deoxyhemoglobin, oxyhemoglobin and total hemoglobin concentrations (Figure 2). Variation from baseline in the absorption of near-infrared light (780 nanometers for maximal absorption by oxyhemoglobin and 830 nanometers for deoxyhemoglobin) is translated into changes in hemoglobin concentration as millimoles per millimeter of lightpath. Total hemoglobin is calculated as a simple sum of the signals for oxyhemoglobin and deoxyhemoglobin. These measurements were recorded in 24 contiguous areas of the cortex of the occipital, left parietal, and frontal lobes during 20 seconds of activity and 50 second relaxation period.

Statistical Analysis

The primary outcome variable was the average of the maximal increases in deoxyhemoglobin, oxyhemoglobin and total hemoglobin in each of the 24 channels in each cortical area. Distributional assumptions were tested using the Shapiro-Wilk test. Average maximal values were described using means and standard deviations by each task, cortical lobe, and type of hemoglobin. Differences between tasks were tested using one-way Analysis of Variance (ANOVA). Correlation between average maximal value and age was described and tested using Spearman's Rank Correlation by hemoglobin type, cortical lobe, and task, then again collapsing over all values to maximize the power to examine a crude linear relationship. Two-sided level of significance was set at 0.05.

RESULTS

Figure 3 shows the average of the maximal changes in deoxyhemoglobin, oxyhemoglobin and total hemoglobin levels by cortical lobe and task. All activities were associated with increases in deoxyhemoglobin, oxyhemoglobin and total hemoglobin in all areas of the cortex studied. However, in the frontal lobe, only the novel integration task was associated with a significantly greater increase in hemoglobin over at least one of the rudimentary tasks ($p_{\text{deoxy}} = 0.008$, $p_{\text{oxy}} = 0.03$, $p_{\text{total}} = 0.008$), whereas no differences were seen between the rudimentary tasks and the non-novel integration. Average maximal total hemoglobin levels in the left parietal lobe were significantly different between the visual rudimentary task and the novel integration as well ($p = 0.03$) though no other significant differences were noted. There was moderate, negative, but significant linear correlation between change in hemoglobin and age (Figure 4, $\rho = -0.49$, $p < 0.001$).

DISCUSSION

The novel spontaneous integration of rudimentary tasks, our definition of play, significantly increased cerebral cortical blood volume over that associated with the performance of the individual tasks alone or their integration in a more familiar non-novel manner. This increase was especially evident in the frontal lobe, an important integration site. Interestingly, the increase was greatest in the youngest subjects with presumably greater vasoreactivity, greater brain plasticity and greater potential for learning.

The definition of play used in this study is certainly not a perfect one and the element of surprise or anticipation cannot be measured. We attempted to break play activity down into basic rudimentary components and then control the manner in which

they were integrated, i.e. familiar and routine versus novel and spontaneous. The subjects were deliberately asked to perform the novel integration task last to avoid a false positive result due to habituation.

The averaging of values across wide areas of the cortex no doubt underestimates hemoglobin changes in critical areas of interest such as the precentral motor cortex, Broca's and Wernicke's speech areas and the paramedial areas of the visual cortex. However, placement of the 24-channel probe array was somewhat variable and localization of a specific cortical area within a specific channel was not possible. Therefore, averaging of hemoglobin changes within the entire array seemed more meaningful and reproducible. Averaging hemoglobin changes across an entire cortical area might possibly provide more information regarding important associative neuronal activity.

While novel integration activity produced greater hemoglobin changes in all areas of the brain studied, the significantly greater changes in deoxyhemoglobin, oxyhemoglobin and total hemoglobin found consistently in the frontal lobe suggests enhanced metabolic and neuronal activity induced by playful activity. These data provide physiologic support for a potential relationship between play and learning.

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FIGURES

Figure 1.

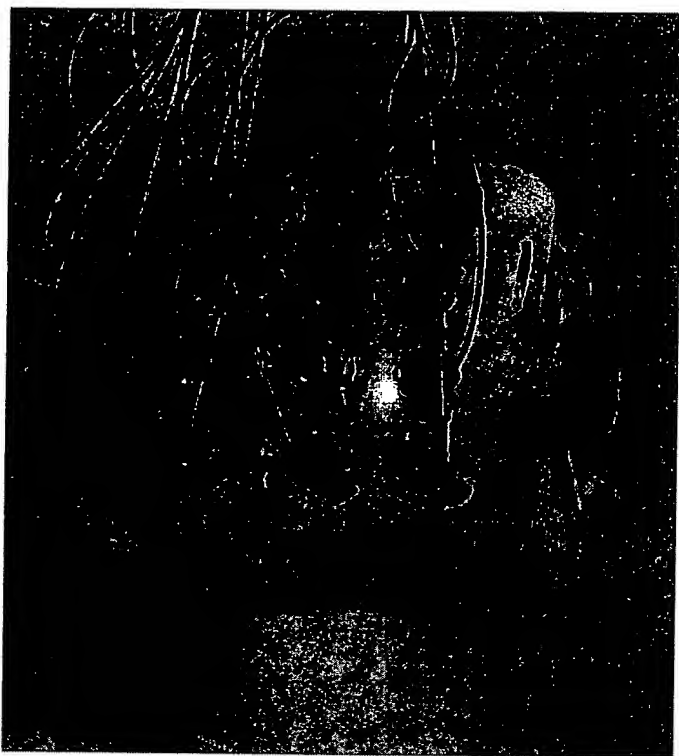


Figure 2.

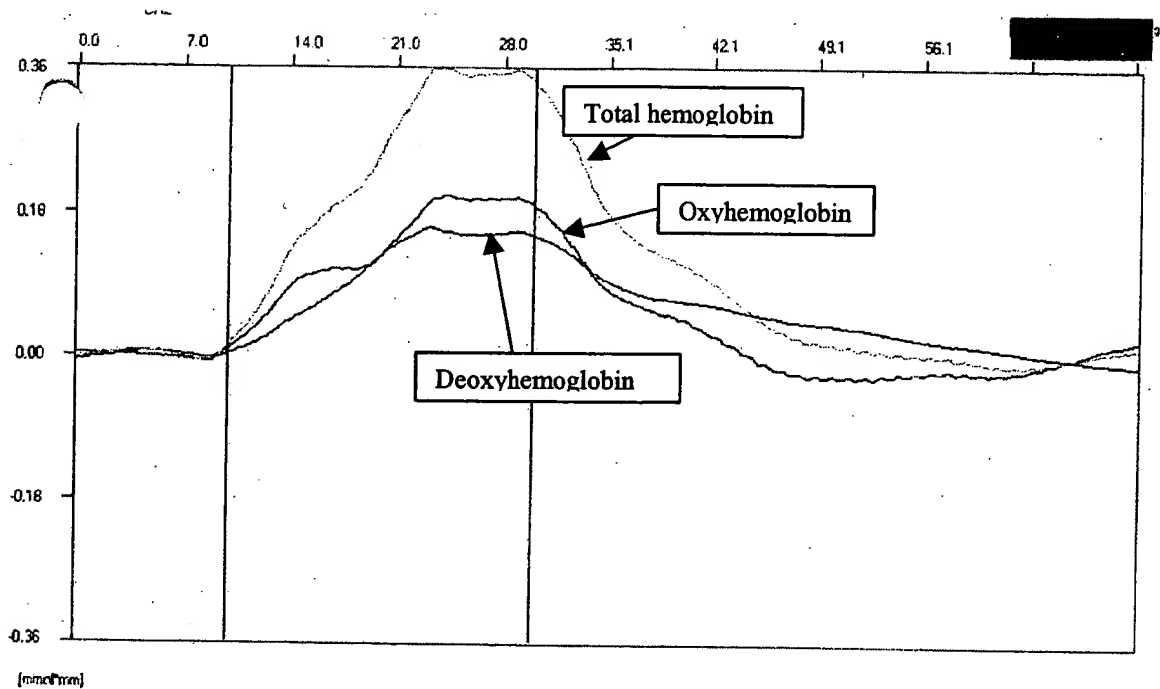


Figure 3.

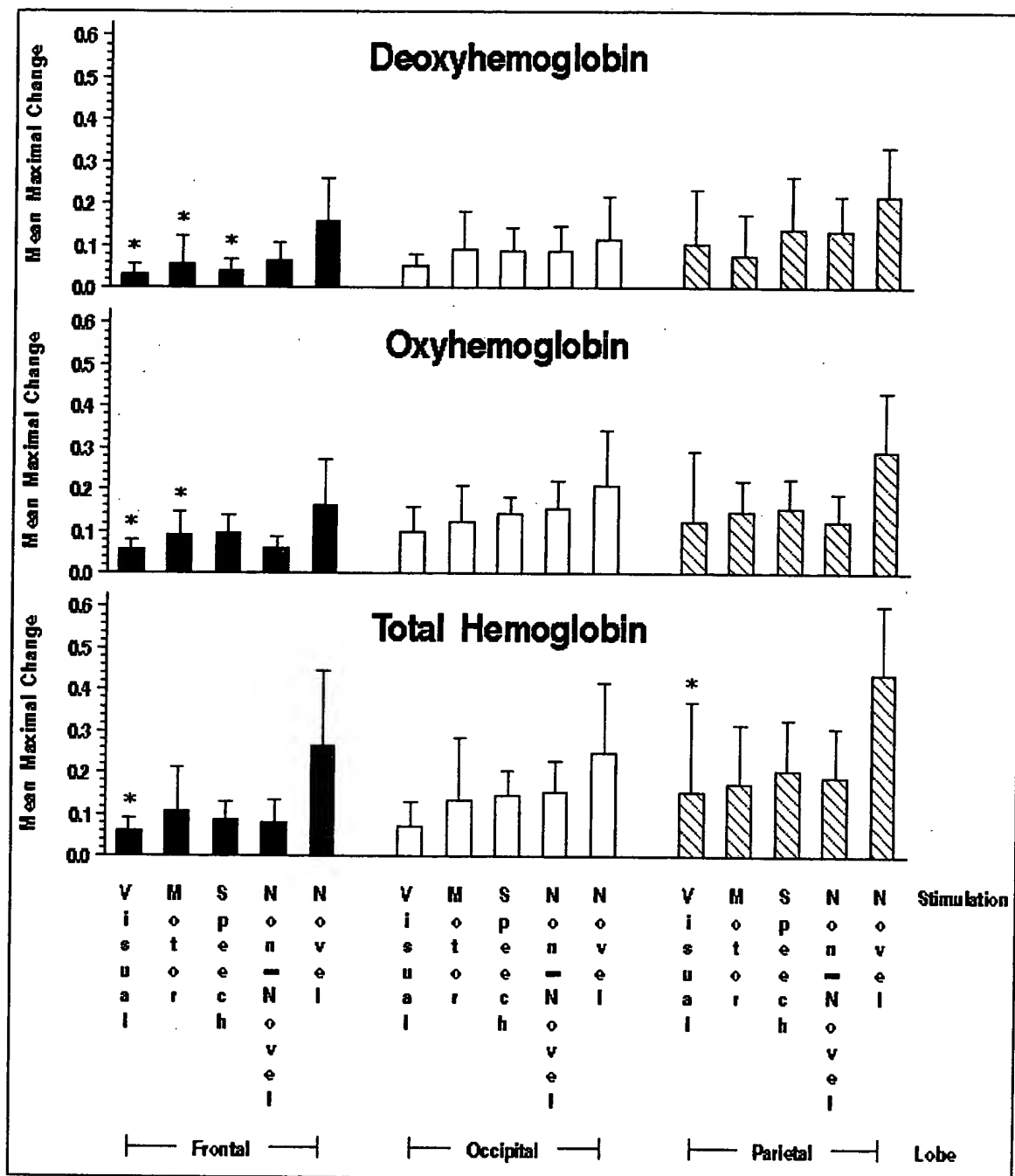
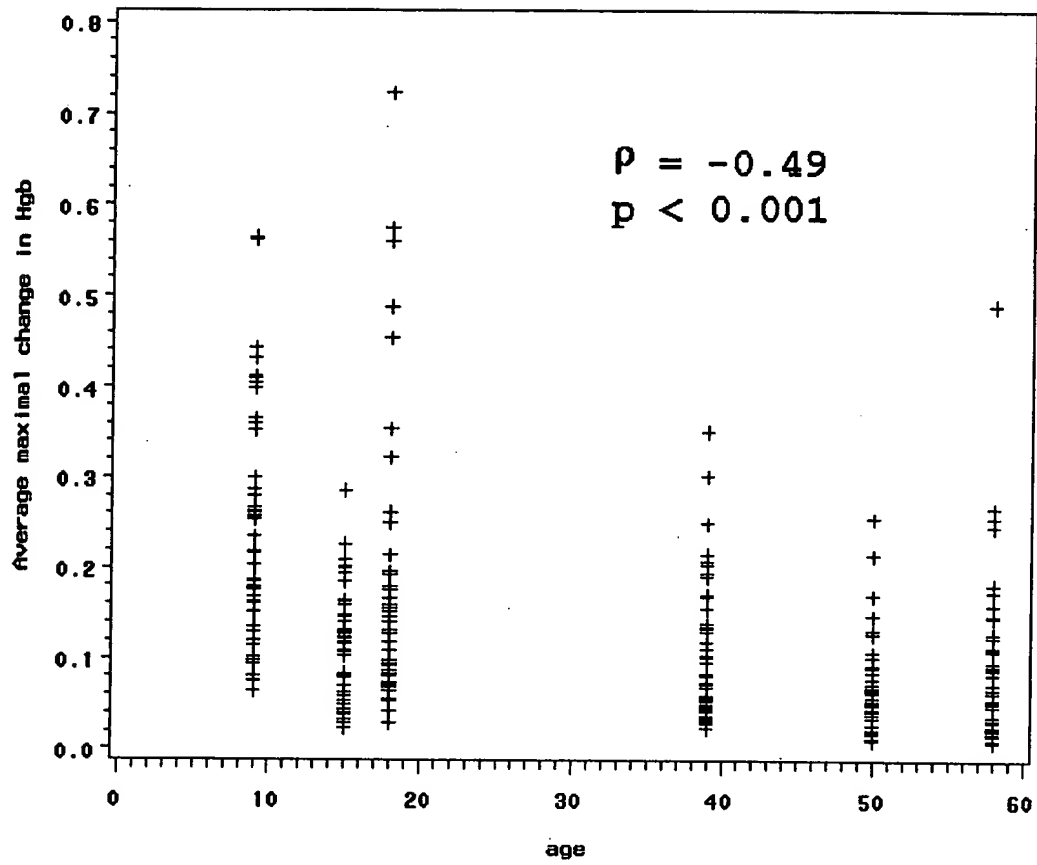


Figure 4.



LEGENDS TO FIGURES

Figure 1. Occipital positioning of the optical topography array of near-infrared light emitters and detectors defining 24 contiguous areas of measurement of hemoglobin changes. The same array was used over the left parietal and frontal lobes.

Figure 2. A representative single channel from the optical topography array showing the changes in deoxyhemoglobin, oxyhemoglobin and total hemoglobin associated with a 20 second activity period followed by a 50 second relaxation period.

Figure 3. Mean and standard error of average maximal increase in deoxyhemoglobin, oxyhemoglobin, and total hemoglobin (micromoles/millimeter lightpath) for the frontal, occipital, and parietal lobes for each task performed. Each form of hemoglobin increased in all areas studied with each activity, however statistically significant additional increases compared to individual tasks were consistently noted with novel integration (*), but not with non-novel integration.

Figure 4. Overall correlation of change in hemoglobin versus age of the subjects. The youngest subjects demonstrate the greatest variation in hemoglobin change.